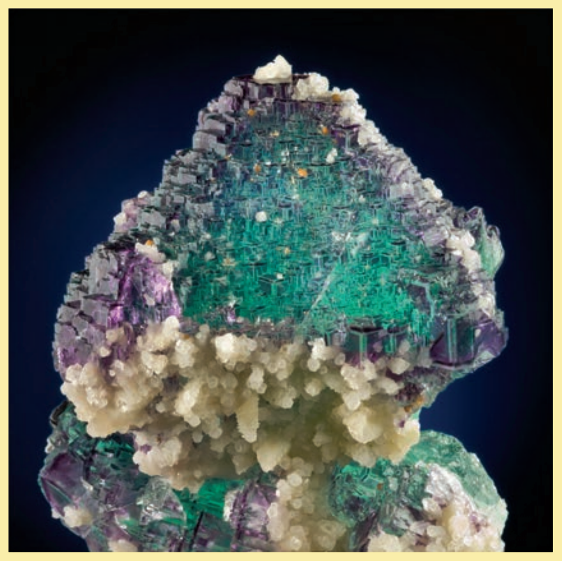
CRYSTALLINE TREASURES

The Mineral Heritage of China



中国

水無石不清
園無石不秀
室無石不雅
人無石不傑

壬辰年夏陳永德書

The river that does not have stone will not be clear,
The garden that does not have stone will not be beautiful,
The room that does not have stone will not be elegant,
And the person who does not have stone will not be eminent.

Chinese proverb

Viewing stone photo courtesy of Kazuo Kuwabara. Calligraphy by Chen Yong De.

CRYSTALLINE TREASURES

The Mineral Heritage of China

中国

by
Guanghua Liu, Robert M. Lavinsky,
Eugene S. Meieran, Harrison H. Schmitt,
Thomas P. Moore & Wendell E. Wilson

with Forewords by
Steve Smale, Jia Yueming & Jiahua Shou

and specimen photography by
Joe Budd

A SUPPLEMENT TO THE MINERALOGICAL RECORD, JANAURY-FEBRUARY 2013

Why Chinese Cinnabar is so Expensive *Wendell E. Wilson ©2004*

CONTENTS

Photo Folio

CRYSTALLINE TREASURES

The Mineral Heritage of China

Exhibitors at the Flandrau Science Center, University of Arizona
Mike and Debbie Ausec, Rick Beard, Irv Brown
Isaias Casanova, Sharon Cisneros, Ralph Clark
Bob Downs, Gene Meieran, Michelle and Jim Houran
Mike Keim, Rob Lavinsky, Paula Presmyk
Alex and Laura Schauss, Gail and Jim Spann
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The Wuxi Science Museum and China View Stone Park Association
Dr. Guanghua Liu, AAA Minerals China
The Mineralogical Record
The Arkenstone

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Cover photos:
(top left) Calcite crystal, 15 cm, Daye mine, Hubei, China
(top right) Fluorite, 17.5 cm, Yaogangxian mine, Hunan, China
(bottom left) Fluorite, 12 cm, Yaogangxian mine, Hunan, China
(bottom right) Scheelite, 16.5 cm, Pingwu mine, Mt. Xuebaoding, Sichuan, China
Joe Budd photos

PERSPECTIVE

From outer space, looking back at the jewel of the blue Earth and forward at the harsh gray face of the Moon, one can only marvel at the stark contrasts between the two, and wonder about the origins of each. And clearly, only the study of the geology—the rocks and minerals and formations on both globes—can provide answers to these important questions. China, because of its large land mass and its geological and mineralogical diversity, offers a singular place to do such studies—which cannot be conducted without the collecting of specimens.

Apollo explorations of the Moon—the ultimate collecting trips—illustrate the value to science of collected specimens. We carried out the documentation and collection of minerals, regolith (soil) and rocks from six sites. Those explorations and collections partially represent about 5 percent of the lunar surface, or the equivalent of about 20 percent of the land area of China. Only small areas around each site, however, could be explored in detail, given the times available for each mission. However, remote sensing data from various missions in lunar orbit has permitted photo-geological and geochemical extrapolation from various aspects of the knowledge obtained directly from lunar samples.

From the very beginning of planning for the analysis of returned lunar samples, advisors to NASA, including planetologist Eugene M. Shoemaker and this writer, insisted that the results of these analyses be open to the international community. The work of international teams of research scientists, as well as individuals, over the last 43 years have converted the data from the Apollo sample collections into remarkably detailed hypotheses concerning the origin, evolution and resource potential of the Moon. These hypotheses have also illuminated questions related to the origin, evolution and future needs of the Earth, and they have greatly aided scientific inquiry into the nature of other terrestrial (rocky/metallic) planets in our solar system.

Three of the many examples of the scientific return from Apollo serve to illustrate the value of human lunar and planetary exploration. First, the Apollo collections permit the testing of the two major competing hypotheses for the origin of the Moon; one suggesting that the Moon evolved independently of the Earth and was captured by it, and the other suggesting that the Moon evolved from the debris blasted into Earth orbit by a giant asteroid or planetoid impact. Second, the apparent early evolution of the Moon's crust and upper mantle through the fractional crystallization and differentiation of a magma ocean has stimulated hypotheses related to the evolution of very early magma oceans on all the terrestrial planets and large asteroids. Finally, the existence of a fine-grained, impact-derived regolith on the Moon has elevated the probability that clay mineral templates dominated the surfaces of the Earth and Mars during the formation of life's precursor organic molecules.

Application of new analytical techniques by a diverse international community to the examination of Apollo lunar samples continues to enrich understanding of the Solar System. In addition to knowledge gained from the discovery of six new titanium-rich minerals found in samples of the lunar mare basalts collected by Neil Armstrong, our understanding of common planetary minerals and their roles in planetary evolution has been expanded by the continued examination of lunar silicates (e.g., plagioclase, pyroxenes, olivine, and zircon), oxides (e.g., ilmenite, spinels and chromite), phosphates (apatite and whitlockite), silica (quartz, cristobalite and tridymite), a sulfide (troilite), and native iron. Further, recent work has discovered that the orange and green pyroclastic glasses contain water in addition to the many other volatile elements previously identified.

Potentially the most important technological discovery made during analysis of lunar samples was the identification of helium-3 in samples of regolith. Helium-3, along with hydrogen, helium-4, carbon and nitrogen, reach the Moon as components of the solar wind. This light isotope of helium is an ideal fuel for nuclear fusion power, both for use both in terrestrial power plants and in interplanetary rockets.

Future lunar exploration has much more to tell science about the Moon and the terrestrial planets. The 95 percent of the lunar surface yet to be explored will surely contain many surprises, particularly in the large basins, the lunar far side, lunar interior and the lunar poles with their additional potential resources. Unique radio astronomy observations from the lunar far side can look out at the earliest history of our universe. Experience and simulation in lunar landings, lunar living and surface exploration will pave the way for the human exploration of Mars. The international community has much to look forward to with a return to the Moon.

As the reader of *Crystalline Treasures: The Mineral Heritage of China* will learn, understanding of the Earth, the Moon and the planets rests on the foundation of studies of the minerals of the Earth. Such studies will lead to further improvements in methods of extracting those minerals, and will inspire the creation of useful products to improve the lives of all humankind. China, with its huge surface area and extensive mineral deposits, offers a great opportunity to gain such understanding.

Harrison H. Schmitt
November 9, 2012

Dr. Harrison H. Schmitt, as an Apollo 17 Astronaut, was the 12th and last person to set foot on the Moon. He is a geologist and former United States Senator from New Mexico, and currently works as an aerospace and earth science consultant.

Stibnite crystal group on matrix from the early-1990s finds, 27.3 cm, from Lushi, Sanmenxia Prefecture, Henan, China.

FOREWORDS

中国大陆所经历的地质演化是地球上最壮观、最漫长与复杂的，不仅塑造了最神奇锦绣的山川河谷面貌，而且生成了最丰饶美丽的矿物晶体财富。刘光华博士择其精华向世界推介，既反映了他独具匠心的审美情趣和科学素养，又体现出中华文化崇尚“天人合一”的哲学智慧和光辉传承！

China has experienced some of the Earth’s longest, most spectacular and most complex events in geological evolution, which not only created our magnificent landscapes of magic mountains and fantasy valleys, but also generated the most beautiful and diverse of mineral treasures. This book introduces some of the finest minerals found within China to the outside world, demonstrating their distinctive aesthetic appeal and scientific importance. Reflection on these specimens illuminates a traditional theme in Chinese culture and philosophy, namely the creation of an emotional link that stresses the unity of man and nature, and ties together the forces of heaven and earth.

贾跃明

Jia Yueming November 26, 2012

Professor Jia Yueming is an eminent geologist, and the Curator of the China Geological Museum (Beijing), the largest and most widely known museum of natural history in China.

中国地质构造复杂，岩石类型齐全，产出的矿物晶体十分丰富，如世界上著名的香花石、湖北石、奥托石就产在中国。

在中华赏石文化的悠久历史中，矿物晶体作为观赏石中的一大类，在近代，尤其是上世纪80年代以来，越来越受到收藏家的喜爱。

目前，在中国已形成了湖北黄石、湖南长沙、湖南郴州、广西桂林等四大矿物晶体集散地，每年的交易额数以亿计。在各省地质博物馆、自然博物馆以及个人收藏博物馆中，矿物晶体的收藏、展出逐年增加。

特别是中国观赏石协会成立以来，分别于2006年、2011年在北京和湖南郴州举办了两届国际矿物晶体博览会，刘光华博士承办了2006年的北京矿物晶体国际博览会，反响强烈，引起轰动，受到了参观的各级领导和社会各界的一致好评。

本书的出版，将进一步加深西方国家对中国矿物晶体的了解，推动东西方赏石文化的交流和合作。

The complex tectonics and the varied rock types of China are the source of a great variety of mineral crystals and new species, including hsianghualite, hubeite, and ottensite. Mineral crystals, now being considered as a worthy addition to the culture of stone appreciation prominent throughout Chinese history, have been attracting the interest of more and more people, particularly since the 1980s. At present, China has four distribution centers for the sale of mineral specimens: Huangshi in Hubei Province, Changsha and Chenzhou in Hunan Province and Guilin in Guangxi Province. Hundreds of millions of dollars change hands there annually. In the state and provincial Geological Museums and Natural History Museums, as well as in private collections and museums, the ratio of mineral specimens among the exhibited objects is increasing every year. Following the establishment of the China Viewing Stone Association, two International Mineral Conferences and Exhibitions were held, in Beijing in 2006 and Chenzhou in Hunan in 2011, both co-hosted by Dr. Guanghua Liu. These events received strongly positive responses, causing a sensation among the public and receiving praise from leaders at all levels of the community. The publication of this book will further deepen the understanding of Western countries regarding China’s mineral crystals, and will promote exchanges and cooperation between the traditional stone culture and the rising mineral collecting communities in both the East and West.

寿嘉华

Madam Jiahua Shou
November 23, 2012

Madam Shou is the former Director of the China Geological Survey, former Vice Minister of the Land and Resources Ministry of China, and the current Chairman of the China View Stone Association in Beijing.

These few words come from my experience of collecting Chinese minerals, especially while residing in Hong Kong for almost ten years (1995-2001 and 2009 to the present). During that time I have visited Changsha and met with Chinese dealers in Shenzhen. Also these dealers have often come to Hong Kong to show me pieces. From this perspective, I can give a strong affirmation of the account and views of Robert Lavinsky and Guanghua Liu regarding the rapidly developing culture of transmission of mineral specimens from the mine to the dealers and from the dealers to collectors.

I myself have profited from this development by building a (sub) collection of Chinese minerals of which I am proud. I must emphasize the importance of the Chinese dealers in the growth of this great activity. I am indebted especially to Zhigang Liu, Robert Dzwillo, Zhouping Guo, He Xinjian, and Zheng Jian-Rong.

This book describes so well the various aspects of the specimen mining market in China that I have nothing to add. I can only corroborate the insights and stories to be found here, especially those of Guanghua Liu and Rob Lavinsky. I want to congratulate them for putting together such a beautiful publication.

Steve Smale

Steve Smale
Mathematics Department
City University of Hong Kong
Kowloon, Hong Kong
November, 2012

Professor Stephen Smale, an American collector of outstanding mineral specimens, was Professor of Mathematics at the University of California, Berkeley and a recipient of the prestigious Fields Medal in Mathematics; he now resides and does research in Hong Kong. His contributions have significantly impacted science, technology and economics. Steve has one of the world's finest private mineral collections, and has expanded it to include many fine Chinese specimens.

Fluorite with quartz, 12.5 cm, from the Piaotang mine, Xihuashan ore field, Dayu County, Ganzhou Prefecture, Jianxi Province, China. Found in 2008; Steve Smale collection.

PREFACE

Three major defining characteristics of a civilized society are its culture, its economic power, and its scientific and technological infrastructure. Culture incorporates music, dance, literature, popular entertainment, the securing of basic human rights, and other phenomena that largely appeal to the human emotions. Economic power relates to financial systems, wealth and wealth distribution, and economic durability and growth potential, and generally relates to the structure of a society, including its laws and how they are enforced. Science and technology relate to how the society advances and keeps up with the rest of the world. That is, science and its offshoot, technology, appeal to the analytical and inquisitive part of the brain; science addresses how things work, and if a society knows how things work it can make technological advances that improve living standards.

Quite often these three vectors do not relate directly to one another. Financiers and economists rarely care about artists and poets except where caring might benefit them personally; their policies and procedures are totally independent of the artist's concerns. Scientists care little about economic policies; their concern is rather with how things work, and what can be done to improve whatever technologies interest them. Artists care about their individual creations and often do not worry about society's judgment of their work. These three communities operate quite independently, but when they do cooperate, society benefits in a major way.

One area where the three communities converge is in the study, exploitation and appreciation of mineral wealth. Here the term "wealth" has three different but equally valid and complementary meanings. To the economist, mineral wealth quite literally means how economically valuable the mineral deposits are (for domestic use in manufacturing things, or as trade items). To the scientist, natural minerals and crystals offer a stunning view of the universe, from the smallest details of radioactive decay, to the processes which form the heavier elements inside stars, to the large mechanisms whereby galaxies, solar systems, and planets are formed. To the artist and dreamer, natural rocks and minerals offer stunning images of nature, and a uniquely aesthetic form of nature art expressing itself in crystals and canyons and mountains. Consequently, all three pillars of a civilized society view mineral wealth as something of great value, whether to the pocketbook, to strategic planning, to education and analysis, or to the creative imagination. Although its still-unexploited mineral resources are vast, China has already tapped significantly into the financial, as well as the scientific and aesthetic, ways of valuing minerals.

On the other hand, compared to societies particularly in Western Europe and America, China has lagged in one form of appreciation of naturally occurring objects: the building of collections. While beautiful Chinese-made works of art in ceramics, porcelain and jade have become widely collectible across all cultural boundaries, Europe, and more recently the United States, have excelled in creating vast collections of crystallized minerals. Many of these collections are now proudly exhibited in museums such as the Smithsonian Institution, the Natural History Museum in London, the Houston Museum of Natural Science, the new Perot Museum in Dallas, the Hermitage in St. Petersburg, the School of Mines in Paris, and others. Such collections are also staples in many educational institutions which have departments dedicated to the study of mineralogy. China has few such institutional mineral collections and even fewer private collections; most of the world's great museum collections of minerals (and fossils) had their origins in donations and bequests made by private collectors, a cohort which has been largely absent in China.

But with recent Chinese discoveries of some of the most beautiful mineral specimens ever seen, this historical reluctance to create collections of minerals seems to have changed. Chinese collectors are now frequent visitors to major mineral shows all over the world. Some historically important mineral specimens from other countries which were once regarded as the "best of their kind" have now been surpassed by Chinese specimens: perhaps the best known example is that of stibnite. The once dominant stibnite crystals from Japan, believed for hundreds of years to be the finest on earth, are now regarded as second-class by comparison to the huge stibnite crystals and crystal clusters found in the Xikuangshan and the Wuling mines in China. Fluorite from many locations in China is as good as or better than the old classics from Illinois and England. Such naturally occurring works of art, long appreciated by the Western world, are finally starting to gain visibility, recognition and popularity in China.

Furthermore, the very properties of the crystals that make them so attractive also contribute to making them important in both technological and financial ways: a true intersection of economics, culture and technology. Many of the crystals in this book serve as indicators to help locate sources of the rare-earth elements which are extremely critical for the electronics industry. Deposits that produce the world's finest stibnite crystals are also the sources of industrial amounts of antimony. Azurite comes from the copper deposits, and silver, obviously, from the silver deposits. But this mixed blessing is also a mixed curse; many mines in Europe and the United States prohibit the collecting of these beautiful and rare specimens, sacrificing them to the economic realities of mining for profit through modern mechanization. Collecting great specimens must often take second place to the rapid extraction of valuable metals from huge ore deposits, in which process many great crystals which might otherwise have been seen and admired are instead destroyed. Only very wise people, corporations and institutions protect these examples of nature's art, for they know that every crystal masterpiece destroyed is an irretrievable loss for humanity.

This book, then, conveys the wonderful and growing legacy of China in the world of collectible mineral specimens by showing how these amazing works of art occur, where they are found, and how their value (scientific, financial and aesthetic) is appreciated. The illustrations give readers the emotional thrill of seeing for the first time many of the great specimens which have been uncovered in recent years. If history does indeed give lessons about what to expect from the future, Chinese mineral specimens are about to emerge as one of the Earth's greatest natural treasures, to be appreciated for what they are and for what they represent: Nature at its best, creating extraordinary works of art for all to enjoy.

Eugene Meieran
Phoenix, AZ
October 30, 2012

Dr. Eugene S. Meieran, a long-time mineral collector, received his doctorate in Materials Science from Massachusetts Institute of Technology and has enjoyed a long and distinguished career in research for the semiconductor industry. He is the author of over 60 technical papers, and the recipient of three international awards for his research. He is retired as a Senior Fellow at Intel, where his duties included debriefing returning astronauts regarding the functioning of onboard computers during space missions. Dr. Meieran is a member of the National Academy of Engineering.

Morganite (pink beryl) on feldspar, 16 cm, from the Pingwu mine on Mt. Xuebaoding, Huya Township, Pingwu County, Mianyang Prefecture, Sichuan Province, China. Found in mid-1990s, and among the first specimens exported to the West from this district. Eugene Meieran collection.

INTRODUCTION

China, one of the world's largest countries, has not only a long mining history but also abundant mineral resources. Although mineral collecting never became a tradition in China as it did in Europe and the United States, beautiful mineral specimens from China have been emerging on the international market since the mid-1980s. Chinese specimens have amazed collectors worldwide, but are now also stimulating a rising interest within China itself, in government museums, in mining institutes and among private collectors.

The history and trajectory of Western civilization has in part been determined by use of natural resources, and by the application of research in mineralogy and mineral deposits. Researchers have come from the ranks of young people inspired to get into the sciences. The West has a tendency to preserve mineral specimens and to look on them both as display pieces and as objects for scientific research in a way that Chinese culture traditionally has not; the Chinese have only recently, tentatively, begun to adopt the Western approach. To this day, Chinese museums of natural history still differ significantly from their Western counterparts. We will explore and comment on this cultural difference, and on the significance of the Chinese government's new awareness of it, and on the government's recent attempts to make changes that will inspire young people in the sciences.

After World War II, the Communists under Mao Zedong established a dictatorship that, while ensuring China's sovereignty, imposed strict controls over everyday life and inhibited international scientific exchanges. Aesthetic art collecting was prohibited, and public education in geosciences was completely neglected. During that time the Western countries got little or no information about mining or minerals from this huge country—and vice versa. With very few exceptions, all crystals and mineral specimens found in the course of mining were consigned to the refining mills or the waste dumps. They simply were not saved, while, by contrast, Western museums and collectors for centuries had been saving specimens, especially those from European and American mines. Additionally, no Chinese people, not even the miners, had any awareness of the value (be it aesthetic, scientific, or economic) of crystallized mineral specimens to the outside world.

After 1978, Deng Xiaoping gradually opened China to the West and introduced market-oriented reforms. Consequently, the Chinese began to realize the international market value of mineral specimens, and a great number were recovered from the mid-1980s to the early 2000s, as the mining industry bloomed, and small, manually operated mines proliferated. However, since 2005 fewer and fewer mineral specimens have been found and saved, because many small mines have closed for safety and environmental reasons.

Rock and stone collecting, on the other hand, has been quite popular in China at least since 200 B.C., when the royal families sought and preserved rare, artistically shaped natural stones. At present, there are millions of "viewing stone" enthusiasts in China. Unlike Western mineral collectors, they are mainly interested in strange, interestingly shaped and historical stones found mainly in erosive regions such as rivers, mountains and the windswept Gobi Desert. Indifferent to what these stones are in composition, collectors care only about what they look like or where they are from. The reasons for these differences in cultural appreciation of items of natural beauty are worth examining.

It was with China's opening in the early 1980s, and the arrival of Western visitors, including collectors and mineral dealers, that Chinese attitudes about minerals changed: the Chinese were exposed to the concept of a mineral-specimen economy. Beautiful red cinnabar and realgar crystals and large, shining stibnite clusters from mines in Hunan Province were the first groups of Chinese minerals to find their ways into the markets of the Western countries. Interestingly, these minerals had been known to some Western museums and mineral collectors before the 1950s, when China closed its door to the West, because all the mines producing these minerals were jointly operated by Chinese and European companies during the early 20th century, and some specimens were brought out from China at that time, mainly for museums. In those days a number of Western dealers learned that fine single cinnabar crystals could be found most easily by canvassing the local medicine shops, which sold powdered cinnabar as a pharmaceutical substance. Some shops even stocked crystals, and if you were lucky you could find such shops (Mary Fong-Walker, personal communication)!

During the last two decades, the Chinese mineral dealer community has expanded exponentially, as international exchange of information itself has expanded, thanks to the Internet. Consequently, large varieties and quantities of fine Chinese minerals are now appearing in the international markets. China is rich in mineral deposits and its mining industry is highly active, so this flood of specimens from an increasing number of localities is not too surprising. Unfortunately, the flood has not been accompanied by an equally copious flow of information about the localities, although recently there have been several significant publications on the subject (e.g. Liu, 2006; Ottens, 2008; and four special issues of the *Mineralogical Record*).

It was not until the mid-1980s that the large community of mineral collectors in the Western world "discovered" specimens from China. Only three decades ago these collectors knew only of a few old crystals of Chinese cinnabar, stibnite and azurite which could be seen in major Western museums or which were pictured in a few publications (e.g. the rare-at-the-time cinnabar twin from the Smithsonian Institution collection pictured on the September-October 1972 cover of the *Mineralogical Record*). But as a direct result of the Chinese policy of "opening the door to the West" in the late 1970s, the Geological Museum of Beijing sent curators

September-October 1972 issue of the *Mineralogical Record*, depicting an old cinnabar specimen from Hunan Province in the collection of the Smithsonian Institution. Joel Arem photo.

to the Tucson Gem and Mineral show in 1980 with an exhibit of display-quality Chinese mineral specimens which had been recently collected. These included cinnabar, realgar, stibnite and beautiful azurite clusters. At the end of the exhibit, many of these specimens were traded for American minerals (or cash) rather than carried home. Several American mineral dealers started traveling to China at this time, although there were as yet no organized mineral markets there.

As mentioned, the Chinese themselves had not been accustomed to collecting mineral specimens, and thus the mineral business in China was poorly developed until native wholesale dealers emerged. When they did, they organized supply channels to get specimens to market more efficiently; also they had to educate the miners about how and what to collect. A whole vocabulary had to be created in order to explain what kinds of specimens had value, and how they were to be collected and protected from damage. The miners were quick to learn, but the process still goes on today as new localities and communities are found and tied into the international market in fine specimens. The earliest mineral trading can be traced back to the 1980s, beginning with academic exchanges between some international museums and organizations and Chinese geological museums in Beijing and Changsha.

The first significant commercial mineral trading took place at the geological museum in Changsha, the capital of Hunan Province and the modern epicenter of the mineral-specimen trade. In the early 1980s, individual mineral collectors and dealers visited this museum and began making purchases from Zhou Xinkuang, the curator. In this way Mr. Zhou made a good profit for the museum, thereby encouraging several geologists and petrologists from the petrography laboratory of the Hunan Geological Research Institute to establish a mineral shop at the museum in 1985. This was the first true mineral shop in China. Mrs. Xia Zhifen, a geologist from the institute, was assigned to be the first manager of the store. Under her leadership the museum's team worked hard to develop a supply of collectible minerals from different mines, especially from the nearby Yaogangxian mine, which remains among the top known Chinese localities to this day. The vast extent of China, with its innumerable sources of collector-quality minerals in still-unexploited localities, presents an almost unlimited potential for growth in the quantity and variety of fine mineral specimens. This potential can be realized thanks to the low cost of mining and the insatiable interest of collectors around the world. The money to be made should help dealers maintain enough motivation, in coming years, to continue tracking down new and lucrative localities and gathering rare and exotic mineral specimens from them.

The growing appreciation of Chinese mineral specimens and their transfer into Western markets has so far inspired only a few Chinese museum exhibits of beautiful crystals. As of the end of 2011, there were 14 natural history museums, 19 geological museums, nine paleontological museums and 12 other science museums with mineral and fossil exhibits in China—all run by the government or by state-owned universities and geological institutions. Although each museum has an exhibition of minerals, most of the specimens displayed are mineral ores or mineral-bearing rocks showing nothing attractive to ordinary visitors. The display methods are mostly primitive, lacking good lighting and attractive case design, and substituting too much text and pictures for actual specimens that might inspire interest. Of course we hope that this situation will change, but the reasons for it include the following:

(1) The main purpose of the few serious museums in China thus far has been to show the types and distribution of the mineral resources in the area where the museum is located, or to showcase local achievements in geological exploration or mining, rather than to show specimens as objects of scientific or aesthetic interest. Public education in the earth sciences has all too often been ignored.

(2) The people running the museums are in many cases not experienced or educated in the earth sciences. Also, much more attention is paid to the dry systematic and scientific aspects of minerals (signage for which can easily be copied from a textbook) than to the beauty and economic value of minerals. In short, the majority of Chinese museums today are designed like a textbook and displayed like a warehouse.

(3) The governmental decision-makers in the past have tended to be very generous in spending money on the museum buildings, making them magnificent, but very stingy with the budget for the purchase of mineral specimens and other objects to be displayed (though it must be admitted that this is a common pattern around the world). Thus museums are always short of funds for purchasing specimens and must rely on donations and loans, of which there are many fewer sources in China than in the West.

Happily, the situation seems to be changing with regard to all three problems just named! In the last few years the Chinese Government has decided to enhance the general public's awareness of minerals and mining by establishing museums and Geo-parks. Several major museums, including the China Geology Museum in Beijing and the Henan Geological Museum, have worked to bring their exhibits of minerals and geology up to Western standards in style and presentation, emphasizing minerals and rocks as objects of science rather than as home decor. A new government initiative has encouraged education in the geosciences through the construction of new, modern museums of natural history. Accordingly the govern-

The Wuxi Science Museum. Rob Lavinsky photo.

Entrance to the mineral hall where the Guanghua Liu collection is on exhibit. Rob Lavinsky photo.

Mineral exhibit cases in the Wuxi Science Museum. Rob Lavinsky photo.

ment has funded over 100 new museums already under construction in big cities, and in the near future it will fund construction of a natural history museum in every Chinese metropolitan area with a population over 5 million (that is, in approximately 200 cities!). Recently, the central government mandated that within the next 10 years every geo-park and nature park in China (197 of them as of October 2012) must establish a geological museum, or at least an exhibit, in the Western, scientific style. As examples, the following major projects are announced here for the first time outside of China:

China Viewing-Stone Parks

Millions of viewing-stone enthusiasts exist in China, served by thousands of stone stores and markets and even a collector's magazine. A government-administered organization, the China View Stone Association, has approximately four million registered members from all major cities of China. Partial statistics show that over 78 major private view stone museums have been opened to the public, most of them in the last five years. Although these collectors currently have a great passion for erosional-remnant view stones, many of them are already showing an interest in mineral specimens as well. No doubt, more and more mineral collectors will be coming from this community.

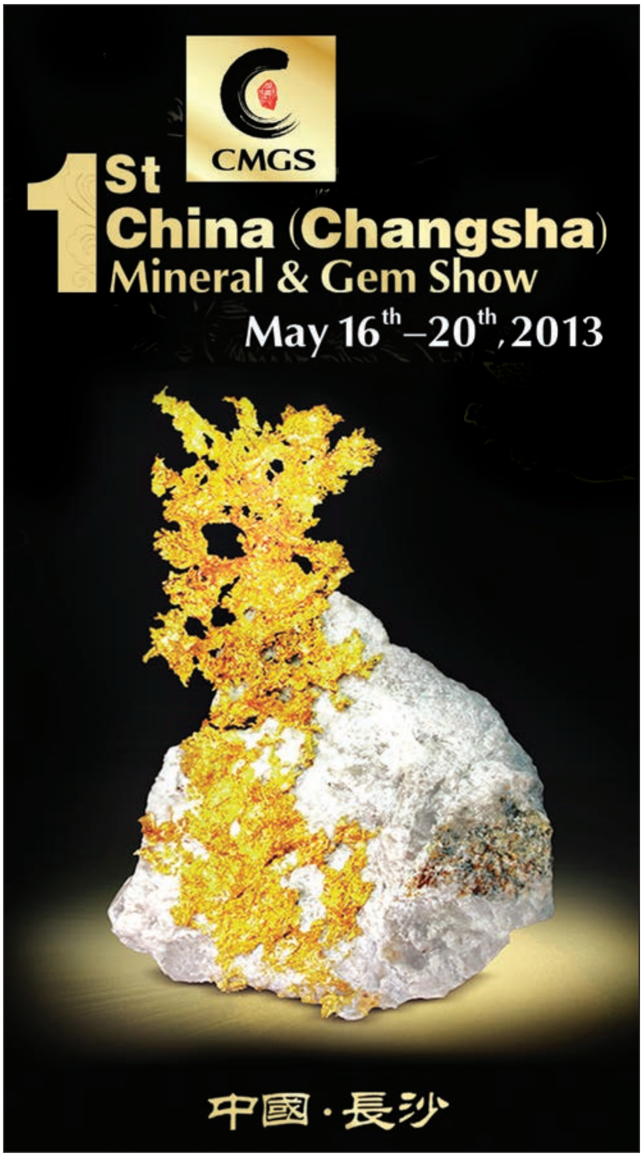
China Viewing-Stone Park is a recent joint project of the China Land and Resources Ministries and the Wuxi City Municipal Government; it covers over 1 million square meters and is situated in the famous Taihu Resort, a short train ride from Shanghai. The project is composed of three parts: (1) a stone/fossil museum; (2) a shopping and training center for lapidary arts and carving; and (3) an interactive "geo-park" which consists of 11 themed sub-parks including the Crystal Palace, Cambrian Ocean, Permian-Carboniferous Rain Forest, Cretaceous Dino-Kingdom, Quaternary Glaciers, etc. The museum and shopping center were completed in November 2011 and are now open to the public.

The Museum is a $40-million-plus modern building with 6,000 square meters of display space, exhibiting various minerals, viewing stones and fossils from all of China and from other countries as well. The Mineral and Fossil Hall exhibits the major crystallized mineral and fossil specimens from the personal collection of Dr. Guanghua Liu. We (Dr. Lavinsky and Dr. Liu) were invited to be curators by the park administration of the Government, and intend to improve and expand the display collection over time. The Chinese government has allocated $1 billion to build approximately a dozen other parks following the same model, spread through other provinces, with associated museums and unique natural tourist attractions.

International Mineral and Gem Conferences and Symposia

In 2006, the China View Stone Association, working with AAA Minerals International (Dr. Liu), organized the First China International Mineral and Gem Conference in Beijing. About 300 participants from all over the world gathered to discuss how to improve public education in natural history in China, especially with regard to minerals and gems. This event was widely reported by over 70 major media including the state-run Chinese Central Television (CCTV) and the English-language *China Daily*, and helped inspire the recent surge in interest within the Chinese government for stimulating mineral education and drawing young students into the earth sciences. Five years later, the Second China International Mineral and Gem Conference was held in Chenzhou, Hunan, the mineral capital of China. It was sponsored by the China View Stone Association, the Chenzhou Municipal Government and AAA Minerals.

As a part of the new governmental initiative, this conference will be held regularly with the financial support of the national government. The 3rd Conference is scheduled to be held at the new museum in the Wuxi Stone Park in 2013.



Mineralogy Society of Hong Kong

The Mineralogy Society of Hong Kong was founded in 2004 by collectors Sam Yung and Anthea Strickland. By 2013 the society had grown to over 100 members, and their annual mineral fair moved from its old location to the beautiful and historic Loke Yew Hall at the University of Hong Kong. The University and the Geological Society joined as co-sponsors, and the two-day Fair has now grown into a week-long "Mineral Festival" in April, with mineral exhibits, sales, lectures, demonstrations and field trips—the largest mineral event of its kind in Hong Kong. (Website: *http://minsochk.org*)

National Mineral and Gem Show

The Chinese National Government and the Hunan Provincial Government are jointly sponsoring the First China Mineral and Gem Show in Changsha, capital of Hunan Province, scheduled for May 2013. The clearly defined goals of the show are to bring in outside influences to spur a market in mineral specimens, to direct more young Chinese into sciences which are useful for resource exploitation, and to grow the related economies.

A large viewing stone (scholar's stone) on its custom-fitted hand-carved wooden base, on exhibit in the Wuxi Science Museum and View Stone Park. Rob Lavinsky photo

Conclusion

In sum, a new mineral culture has begun to grow in China, with dealers, collectors, museums and government people all working to preserve Chinese mineral specimens as never before. The Chinese are becoming aware of the difference between the earlier Chinese collections of natural history and Western-style collections which, when exhibited, serve to educate the public in science and to inspire careers in science and resource development. Several clearly emerging trends guarantee further growth: (1) increasing Chinese emphasis on resource exploitation; (2) increasing personal wealth in China (i.e. the growth of a large middle class with disposable income that can be devoted to collecting); and (3) a growing appreciation for "fine minerals" as collectible art and as examples of natural beauty. The Chinese, no longer content to see their mineral treasures entirely exported to the West, are now beginning to acquire mineral specimens for their own collections and for their public museums. There is no doubt that in the future China will become a huge market for collectible mineral specimens.

Guanghua Liu *and* **Robert Lavinsky**

An olivine-bronzite chondritic meteorite, 10 cm, which fell on February 15, 1997, near the town of Heze on the Juancheng (Yellow River), Shandong Province, eastern China. It was given the nickname "The Harbinger of Death" because Communist Party Chairman Deng Xiaoping died a few days later.

Tectonic Divisions of China

Metal Deposits of China

GEOLOGY

WHY CHINA IS BLESSED WITH SO MANY BEAUTIFUL AND COLLECTIBLE MINERALS

China's domain of over 9 million square kilometers contains widely varying geographic features, from vast plateaus with high mountain chains in the western regions (including the Himalayas, Tianshan and Kunlun Mountains), to the basin and range systems in the southern and northeastern regions, to the plains of the north and east. In all of these different regions, geological processes within a complex history of tectonic evolution have created a great number of mineral deposits. You can see in the maps presented here how the movement of tectonic plates in geological time has created the belts in which most of the mineral deposits are now located, and from which our mineral specimens come. Moreover, the age of a specimen is known if the age of its deposit has been determined, so that for example we can say that our kermesite specimen was formed 200 million years ago, or our Yaogangxian fluorite approximately 150 million years ago. It is a humbling mental exercise to contemplate the great age of mineral specimens that we hold in our hands, and realize that many of these treasures formed hundreds of millions of years ago.

In terms of plate tectonics, the Chinese land mass is a product of a long-term and complex interaction between the Siberian, Tarim, North China, Yangtze, South China, Indian and Pacific plates. Fold zones formed along the converging margins of these plates, whereas basins and plains developed in the stable tectonic settings in the centers of the plates. Mineralization resulting from endogenic processes (i.e. processes occurring beneath the earth's surface) took place in these mountainous fold zones. For example, pegmatite minerals mainly occur in mountain ranges, deposited from the hydrothermal fluids released by the mobilized magmas that accompany mountain-building.

During the Late Permian and Triassic periods (approximately 250 to 205 million years ago), an integrated new Asian sub-continent formed from the collision of many plates after the earlier supercontinent of Gondwana had broken apart. Collision-associated volcanism and metamorphism (changes wrought by heat and pressure) caused extensive mineralization in this mountain zone and the marginal belts of nearby rocks. Again, this is seen clearly in the maps showing productive mineral deposits. For example, the beautiful "chrysanthemum stone" (radiating celestine crystals in rock) of northern Hunan Province, and the unusually large crystals of kermesite found in Shaanxi Province, were formed during this period.

From the Late Mesozoic to Early Tertiary (around 200 to 50 million years ago, while dinosaurs were walking the earth), the Indian continental plate drifted north and collided with the Eurasian continent. This "recent" example of large tectonic movement, continuing to the present day, created uplifting in western China and led to the formation of the Himalayan Range, including Mount Everest and the Tibetan plateau. Almost all collector-quality minerals, including gemstones, in these regions formed during this period. The Gaoligongshan Mountains of Yunnan Province belong to this tectonic zone and are therefore rich in pegmatite minerals and gemstones.

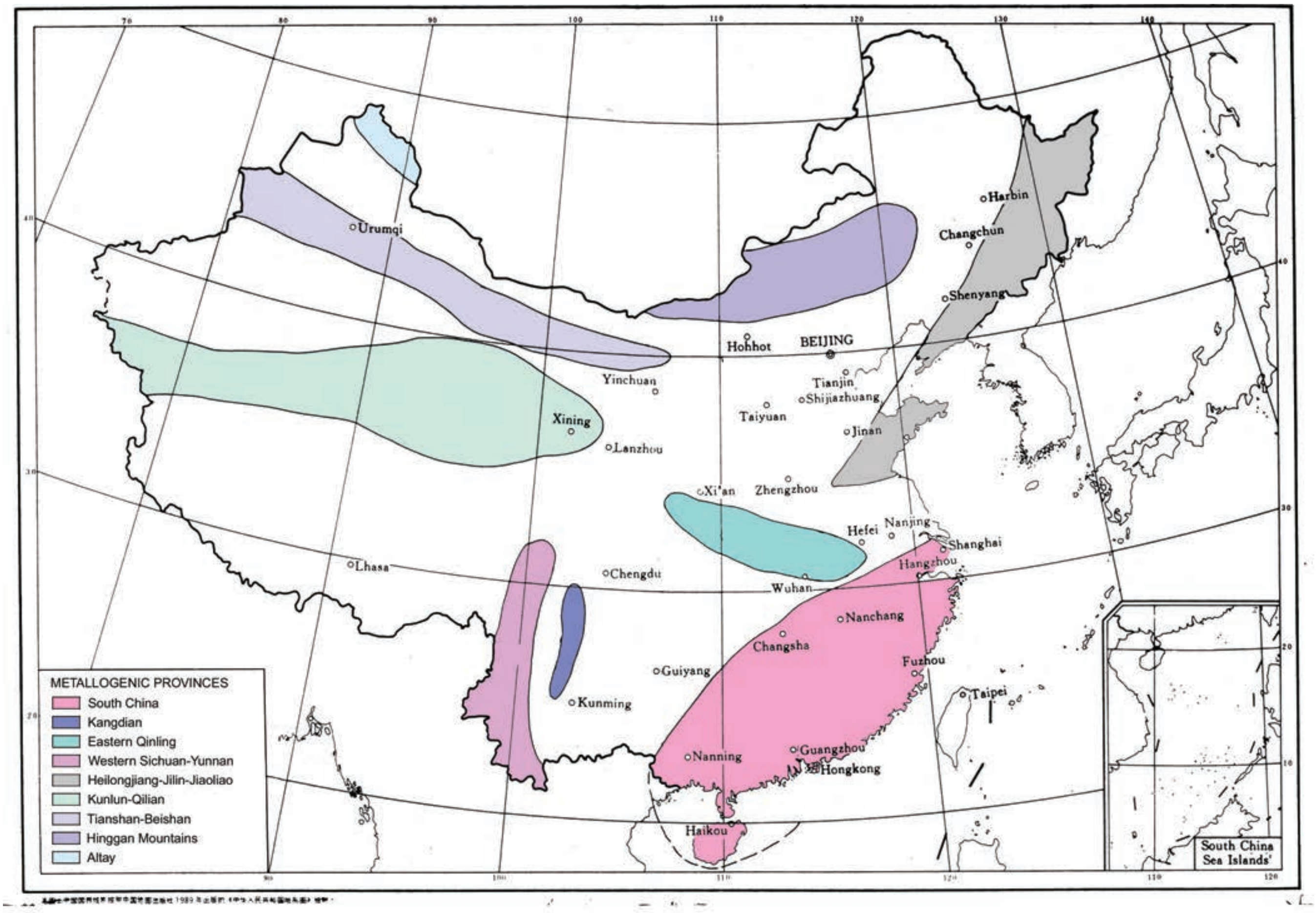
Lastly, the formation of the vast majority of collector minerals so far seen from China, in the metal-rich deposits of Guangdong, Guangxi and Jiangxi Provinces, came near the end of geological movements which commenced in the Late Jurassic and which continue today. These deposits include all the famous fluorite, tin (cassiterite), tungsten (scheelite) and iron mines of this region. These are, to a large degree, products of mineralization that took place when the westward movement and subduction of the Pacific plate took it below the East China margin, beginning in the Late Jurassic (approximately 140 to 150 million years ago); these events made East China a part of an active continental margin. As a result of the upward movement of mantle magma caused by the subduction of Pacific oceanic crust beneath eastern China, and the resulting folding and faulting of mountain ranges, as well as the abundance of groundwater supplied by the high rainfall in these areas, hydrothermal mineralization became very important, creating the kinds of beautiful mineral species that would be coveted, 150 million years later, both by industry and by mineral collectors.

Mineral Deposits

The long-term geological evolution, diverse tectonic patterns, multiple geological processes, and wide range of paleo-climates in China have all combined to produce favorable conditions for mineralization. This explains why 168 types of economic mineral deposits have been found in China. According to their formation and geological settings, we can divide these deposits into endogenic, exogenic and combined types.

Endogenic minerals were mainly formed by magmatic, volcanic and metamorphic processes taking place in the earth. These processes formed most minerals with high physical hardness and chemical stability, including nearly all gemstones. Minerals and orebodies formed by later granitic intrusions and pegmatitic injection are also widely distributed in the mountain zones.

Many economic mineral deposits are formed by chemical alteration of a rock by hot water and other fluids along the contacts between magmatic intrusions and their host rocks. In China this process generally occurred along the former continental margins, now roughly corresponding to the belts of deposits in the accompanying map. Typical deposits formed by this type of hydrothermal mineralization include the copper, molybdenum, lead-zinc, tin and



Metallogenic provinces in China, where most ore deposits occur. This map and those on page 16 reveal how the movement of tectonic plates over geological time has created the "belts" in which most of the modern mineral deposits of China are now found, and from which the specimens shown in this book were recovered. These deposits range in age from 500 to 80 million years—with the greatest number originating during the Age of Dinosaurs.

other polymetallic orebodies which produced the specimens shown in the Photo Folio. Most of the collectible mineral species in the rich mines of southern China (including cinnabar, realgar, stibnite, fluorite, calcite, barite and many others) belong to this hydrothermal type of deposit.

Secondary or exogenic minerals are produced by later physical, chemical and biological processes that alter the original mineral deposits. These minerals originate primarily where moisture and groundwater have caused oxidation and hydration of earlier minerals and rocks at or near the surface. For example, in southern China, cave calcite, aragonite and other stalactitic minerals such as hemimorphite and malachite occur in regions where the climate is hot and wet. The beautiful green pyromorphite and golden mimetite, found recently in lead-zinc mines of Gongcheng and Guilin, also resulted from this type of mineralization.

Although a large variety of collectible minerals have been discovered in China, they have thus far come from only a very limited number of localities, mainly in the South and Southwest. However, mineral deposits and mining activities also exist in the vast Northwest and Northeast regions, where there is great potential for the discovery of more collector-quality minerals in the future.

Guanghua Liu

MINING HISTORY

AN OVERVIEW OF THE HISTORY OF MINING IN CHINA

The industrious ancient Chinese began prospecting for useful minerals in antiquity, apparently before many other cultures did. Coal carvings have been found in the ruins of the Fushun coalfield, Liaoning Province. Their radiometric age is over 6,000 years (Neolithic). The earliest copperware in northern China is also Neolithic, and bronze was widely used during the Shang Dynasty (16th to 11th century B.C.). In 1973 a 3,000-year-old copper mine with smelting facilities was discovered in Tonglushan on Mount Verdigris in Daye County. The Daye copper mines in Hubei Province have a history going back 2,800 years and they are still in production (and providing many of our collector specimens today!). All of these finds indicate that mining activities in China began at least 5,000 years ago.

Today, Chinese minerals are not just collectible treasures, but also huge economic drivers for the rise of China to world-power status. During the last century, common raw materials mined in China were used mainly for construction and weapons, but we now see China taking the lead in the production of elements and minerals used in modern technologies, such as silicon for semiconductors; see also the table of rare earths, below. As collectors, we can hope that China will soon excel in recovering and preserving the crystal specimens found in these new mines as well.

Generally, Chinese mining history can be divided into two periods. The time from 6,000 years ago to the first Opium War (1839–1842) represents the primary stage of Chinese mining development, characterized by simple tools and ancient manual methods. From the Opium War to the present, Chinese mining has been characterized by a combination of Western mining techniques and traditional Chinese methods.

Xia and Shang Dynasties (21st to 11th Century B.C.)

During the Xia Dynasty, copper weapons and tools were already in wide use by 2000 B.C. In the Yin ruins at Anyang, Henan Province, a major archaeological site of the Xia and Shang Dynasties, gold, copper, tin and lead tools and containers have been found. For example, the Simuwu Ding (a sacrificial vessel) found in the Yin ruins contains 84.77% copper, 11.64% tin and 2.79% lead, which is very close to the composition of the bronze alloy having the highest hardness known to the modern metallurgical industry. There is little doubt that ancient China excelled in metalworking. Nephrite and serpentine jewelry have also been unearthed in sites dating to Xia and Shang Dynasty times.

Zhou Dynasty (11th Century B.C. to 221 B.C.)

Great progress was made in mineral identification and mineral utilization during the Zhou Dynasty, as shown by the book *Mountains and Seas* (Shan Hai Jing, 3rd to 1st century B.C.). In this book, 89 kinds of minerals and rocks from 309 localities are described. The writer discusses physical properties such as hardness, color, luster, transparency and texture, and notes that magnetism and medical properties can be used to identify mineral species and rock types. Indicator species (those minerals that commonly occur near gold or iron ore deposits) are also discussed. *Mountains and Seas* also mentions the use of well developed mining techniques, although it does not imply an inherited culture of mining *per se*. Botanical indicators of mineral deposits are recorded in the work;

Medieval woodcut depicting miners at work. Illustration from *Exploiting the Works of Nature* by Sung Ying-hsing (1587–1663)

Excavated ruins of the Tonglushan copper mine, Mt. Verdigris, active from the 11th century B.C. to the 2nd century A.D.

for example: "in a place, one to one and a half kilometers from a hill named Huang Shan, where many Huitong plants grow, gold ore can be found below."

At this time, the Tonglushan mine at Daye in Hubei Province, one of the world's oldest copper mines, was established. It worked the oxidized zone of a high-grade copper deposit: the total length of the ancient trenches and shafts is estimated at 8,000 meters. Next to the old workings, a large open-pit mine for copper is still in operation today, providing beautiful specimens of calcite, malachite and azurite crystals (examples of which are shown here in the Photo Folio).

The astronomer and scientist Shen Kuo (1031-1095) of the Song Dynasty made considerable studies of minerals and rocks. In a famous work called *Chat by Dream Creek*, mineral prospecting, mining activities and mineral utilization during Shen Kuo's time are discussed. For example, Shen pointed out that bluestone (chalcanthite) contains water and can be refined into copper, and he predicted that the oil (petroleum) derived from rocks would be widely used in the future. Shen Kuo clearly described the crystal geometry and cleavage of gypsum, matching its crystal description in modern mineralogical textbooks. Without a doubt, Shen Kuo can be regarded as the pioneer of Chinese mineralogy.

By the middle Qing Dynasty (about the 1740s), the Chinese had already begun to exploit natural gas in Sichuan Province, and thus must have had some understanding of the subsurface geology of the gas-bearing basins of Sichuan. This may represent the first application in China of petroleum and gas geology. The Chinese, with their long history of geological observation and mining, could have played a leading role in world history: what a pity it was that between the time of the Qingshi Emperor (1722—1735) and the mid-19th century, China closed its door to the Western nations

Astronomer and scientist Shen Kuo (1031–1095) of the Song Dynasty. Mineral prospecting, mining activities and mineral utilization are discussed in his famous work *Chat by Dream Creek*. Portrait taken from a 1962 postage stamp.

and refused to import advanced theories and technology relating to mining, geology and mineralogy such as the West developed during the Industrial Revolution.

Modern Times

Since the end of the Opium Wars in 1860, Western science and technology has strongly influenced the development of Chinese mineralogy and the mining industry. Modern geological surveys for the mining industry in China began with exploration for iron ore, since iron was needed for national defense purposes. Between the revolution in 1911 and the Second World War, foreigners ran many mines in China, including the world's largest antimony and tungsten mines. Systematic geological surveys were begun by Westerners, and the most important large-scale mines, including the Xikuangshan antimony mine in Hunan and the Wanshan mercury mine in Guizhou, were operated by Western experts. After the war against the Japanese (1930s–1940s), most foreign-owned mines were returned to the Chinese government, but by that time the majority of them were either depleted or completely exhausted.

Mineral dealer Xiaojun Chen of *The Arkenstone*, collecting underground in the Huanggang complex of mines in 2011.

Since the 1950s, significant developments have been made in three phases. From 1950 to 1967, Chinese mining leaped forward, driven by the large-scale reconstruction and redevelopment of all industrial sectors after the civil war. All of the mines were owned either by the central government or by local governments. The period from 1968 to 1977 was a time of economic depression resulting from the Cultural Revolution and other political movements. Most mines reduced their output, and some mines suspended their production altogether. The total mineral output of China reached a minimum in this period.

After 1978, China entered a new period characterized by political liberalization and economic reforms—changes which enabled the rapid growth of the mining industry. By the late 1990s, according to recent statistics, the economic mineral output of China included 168 different products mined from more than 20,000 deposits. The abundant raw materials for the production of iron, aluminum and cement, as well as many other industrial products, came to be important in world markets. Today, lead, zinc, nickel, tungsten and antimony are crucial for Chinese industry (just as minerals from these very same mines are desirable to collectors), and China has also become the world's leading supplier of politically and economically crucial rare-earth elements.

More than 7 million employees are currently working in the mining industry in China. The mining techniques in use in most mines still remain backward by modern standards, some being shockingly similar to those used in Europe in the 16th and 17th centuries. Vertical and inclined shafts predominate, and modern adits (horizontal tunnels) are uncommon in underground mining, because the wood and steel they require for support is expensive. In many small mines, oil lamps, hand hammers, human transport and rope hoists are the rule. Of course, these conditions make it easier for the miners to recover specimens, if they know how to do so. Miners tend to be uneducated people, chiefly farmers who work in the mines between harvests. Nevertheless, these numerous small and often private mines, and the use of simple, traditional mining tools, are responsible for the emergence of most of the Chinese specimens in the world mineral market in recent years.

However, a great number of these small mines were forced to shut down at the beginning of the 21st century because of enormous problems with safety, the adverse effects of mining on miners' health, and environmental degradation. These problems have been caused by the primitive state of the workings and the rapaciousness of mining operations. Extremely low recovery rates have wasted large amounts of valuable resources, and sprawling mining activities have created serious environmental problems. As modernization sets in, the closing of many small mines and the increasing development of large, efficient operations are having detrimental effects on the mineral specimen market. In small mines, with only limited use of high-tech mining methods, quality specimens can be much more easily extracted, and miners can minimize damage to them. But in large, modern mines, the use of sophisticated mining equipment affords workers fewer chances to find and save collector-quality specimens.

China is a country with almost unlimited possibilities for specimen recovery in the foreseeable future. It is a huge country with vast, undeveloped areas and low mining costs, and so the current variety and quantity of minerals on the market still represents but a small part of the real potential. With the increasing influence of Western tastes in mineral collecting and trading, more and more miners and mine owners are becoming aware of the value of quality minerals, and will extract specimens with more care when they find them.

Guanghua Liu

THE ROLE OF A MINING CULTURE IN CHINA VS. THE WEST

The lack of a mining culture in China like that which developed in Europe is the principal reason why European-style mineral museums and mineral collecting failed to catch on in China. The Chinese mining industry of the Middle Ages never achieved the level of *social* importance that it gained in Europe, and only incremental developments in mining technology took place there for centuries—though smelting and metallurgical knowledge in some ways exceeded that of Europe. As of the early Northern Song Dynasty (a thousand years ago) there were only about 200 metal mines operating in all of China. With some notable exceptions, mining throughout the country focused mainly on small, widely scattered deposits unsuited to heavy capital investment and operated by seasonal, local, unskilled labor. Small mines were soon worked out and the local farmers who had worked in them went back to their farms. Thus, despite a few large operations for iron and copper, no true mining culture (a hereditary and local source of pride within communities of professional miners) developed as it had in old European mining districts like Saxony and Cornwall, and the ruling class apparently never developed the same level of pride in the natural mineral resources of their lands.

Detailed information on mining technology was also scarce in the 16th and 17th centuries. Yingxing Song's *Exploitation of the Works of Nature* (1637) included a chapter on the mode of occurrence and the identification of metallic ores; and Georgius Agricola's *De Re Metallica* (1556) was translated into Chinese in 1640. But without a formal educational infrastructure for training mining men, the knowledge therein spread only very slowly, and so even the written works available were poorly utilized. Some mines known to collectors today (e.g. Yaogangxian and Xianghualing) were already in operation by the end of the Ming dynasty in 1644, but they still employed very primitive methods.

In China, although mining had gone on for thousands of years, a university or college system like that found in Europe failed to develop, and no schools arose for the training of mining professionals until the 20th century. Court-appointed officials (surely without technical training) were sent to manage the largest mines. The Jiaozuo Coal Mining School (later renamed Henan Polytechnic University), founded in 1909 by the British Syndicate Company. Ltd., was the first such institution in the country. Later that same year the Jiaozuo School of Railroads and Mines (now known as the China University of Mining and Technology, currently located in Xuzhou, Jiangsu province) was also established.

Song Yingxing (1587–1644) a prominent scientist of the Ming Dynasty, was the author of *Exploitation of the Works of Nature* (1637). Chapters in this important work covered mining techniques, mining tools, refining technology and various types of ore deposits.

As a result of the Opium Wars in 1839–1860, and the incursion of the British, the ancient and well-organized feudal structure of China collapsed, and the country was reduced to a semi-colonial status. In the latter half of the 19th century, British mining engineers were brought in by British corporations to oversee mining operations at the larger mines in China, and these organizations finally introduced modern mining technology. Unfortunately, the British failed to instill any appreciation for mineral specimen preservation, perhaps because (unlike elsewhere in Europe) the high nobility in England from the 1700s to the present day has mysteriously shunned the collecting of minerals. Had it been the collecting-oriented Germans, Bohemians or Austrians who were the dominant invaders of China instead of the British, the mineral collecting culture in China might have turned out very differently!

Wendell Wilson

MINERALS vs. ROCKS

The Chinese have not traditionally collected minerals, although rock and stone collecting is quite popular and can be traced back to 200 B.C., when the royal families sought and preserved rare stones. Today, some three million people, more or less, in mainland China collect jade, stone carvings, and natural rocks that show uncommon shapes, colors, and structures, or that exhibit unusual properties. Unlike Western collectors, the Chinese are not particularly interested in the scientific significance of their collections or in crystal perfection. Instead they focus on a stone's aesthetic appeal as well as on any potential links to legend, ancient events, famous people, religion or philosophy. In many cases the scientific or monetary value of a stone is much less significant to the Chinese collector than whatever historical or sentimental importance the collector has placed upon the piece. In effect, most Chinese do not collect the stones themselves; rather, they collect a physical representation of the ideas that the stones imply. The importance of a collectible mineral specimen to a Chinese collector is normally not its monetary value, but rather its value as an occasion for spiritual expression and contemplation. In the eyes of most Chinese collectors, until only recently, the first question to ask about aesthetics is not about the composition or quality of a piece, but about what its form and shape imply in a cultural and religious context. Rock collecting in China is therefore more of a cultural than a scientific endeavor, and has not served, as it often does in the West, to inspire people to become deeply interested in the natural sciences. The National Government recognizes this now, and has addressed this difference between our cultures as one of many issues to target in order to encourage young people to pursue the natural sciences, and eventually to accredit themselves in geology and resource management and exploitation. A concerted effort has been initiated to modernize the country's earth science education and museum displays, using the plan of Western museums to popularize science by showing examples of the beauty of the Mineral Kingdom.

People in China do not understand the value and beauty of good minerals in the same way that Western collectors do. This is mainly caused, in my opinion, by poor education in the geosciences: no mineral-related classes are taught in the middle schools and high schools of China, and there have been few international exchanges in recent history.

Shops and stores selling collectible stones to the Chinese can be seen all over China, especially in big cities and tourist spots. Judgments concerning the value of such stones vary from person to person and from market to market. The type and quality of these rocks is subject more to the evaluator's opinion and less to any objective criteria, such as the presence of a rare mineral species or crystal habit. In the Chinese stone market, bigger is generally more expensive. These so-called "view stones" are mainly products of

"Chrysanthemum stone," a dark gray shale from Hubei province containing embedded crystal sprays of white celestine, is widely popular as a viewing stone in China because of its aesthetic resemblance to flowers. *The Arkenstone* specimen (weighing 600 pounds!).

***Mineral Lover*, China's first magazine for mineral collectors, was founded by Yishan Zhou in 2009.**

A mineral shop ("museum") in Guiyang, Hunan. Jeff Scovil photo.

erosion and weathering, and are appealing because of their form and beauty, but among dealers there are no consistent standards used for fixing their monetary values. Although they are supposed to be entirely natural formations, the stones are often reproduced in laboratories and by skillful stone carvers. It often happens that a valuable, well-shaped natural stone inspires many man-made imitations.

Influenced by Western conceptions of mineral collecting and the increasing knowledge of mineralogy and geology, more and more Chinese have begun to take up mineral collecting, with many amateur stone collectors expressing an interest in crystals and fossils in recent years. No doubt, China will be one of the biggest mineral markets in the future.

I am honored to have been selected as the curator of minerals for the most modern-styled new museum so far built in China; the museum is in Wuxi City, outside of Shanghai. The museum website (http://www.51stone.com.cn/) shows illustrations of the beautiful new facilities. Our museum displays my personal collection of crystallized Chinese minerals, obtained over my 30 years as a professional geologist, field collector and mineral dealer.

Guanghua Liu

IN WESTERN EYES

How Western Museums and Collectors judge mineral specimens

For those new to our world, and also to share with the readers seeing this text in the Chinese edition, we will aim here to summarize the most important criteria which are used by contemporary "Western-style" museums and private collectors in judging the quality and desirability of crystallized mineral specimens. Experienced collectors who have spent many years viewing mineral specimens in museum and private collections, and on the open market, all agree broadly about the major criteria for the judgment of "quality" in mineral specimens. That is, a set of standards exists which are more general and universal than those which derive from the personal priorities and specialties of individual collectors, and these standards are broadly applied to all mineral specimens when viewed "in Western eyes." Typically, a collector who looks at a specimen applies the criteria to it quickly, all at once, and perhaps only half-consciously—the criteria are all elements of a *unified* response in the collector's mind. A clear understanding of these criteria, if applied to Chinese specimens by Chinese miners, museums, and collectors, is key to helping them share in Western-style appreciation (and marketing) of these natural works of art.

Cultural and Historical Factors

"Old classic" specimens from famous localities which have not produced such specimens for many years or decades, or for one or two centuries, are favorites with many Western collectors. These classics are most highly prized when they are accompanied by old collection labels and/or other forms of documentation which prove their age and hint at their history as collectors' items. Mineral specimens like these are cherished as witnesses to some of the early history of mineralogy, mining and mineral collecting, and they bring much higher prices in Western markets than contemporary specimens of the same mineral species from a new location (such as a recently opened mine in China), even when the overall quality is the same for the old and the new specimens. Older Chinese specimens, collected before 1990, have now acquired some of this same kind of value and desirability, since so few specimens were preserved from Chinese mines until the 1990s. In fact, the earliest labels we have seen on specimens for sale in the West date from a famous exhibition in 1980, when the Geological Museum of Beijing exhibited for the first time at the Tucson Gem and Mineral Show and exchanged the pieces they showed for American classics to take home. They traded one of their azurite specimens for a significant cabinet-size gold specimen at the time.

Crystal Size and Form

For Westerners, the size, beauty, shape, and perfection of mineral *crystals* are all-important. Of these, the size of the crystals is the most obvious characteristic, and it is roughly true that the greater the maximum size of the crystals in a specimen the more desirable the specimen is. However, there are few absolutes: one must know the size of the largest known crystals of a species in order to judge how remarkable a given specimen is in comparison.

The more nearly perfect the form of a crystal, the more desirable it is to the Western collector. Here again, basic knowledge is crucial. In fact, only a basic knowledge of crystallography will allow a collector to know what the ideal shape of a crystal of a particular species is. In all cases, of course, the sharper the edges of the crystal, and the smoother its faces naturally are (without polishing!), the better the specimen is judged to be. Western collectors tend to put a premium on sharply presented single crystals of any form, and on crystals which display unusual features. For instance, crystals which display faces or crystal forms which are rare for the species, or obvious twinning, are highly valued.

Mineral Colors

In general, bright red, orange, yellow, green, blue and purple minerals are more desirable—when well-crystallized—than brown, black, gray or white minerals. When species which are usually white or colorless appear in crystals which trace elements or mechanical inclusions have tinted in bright, attractive colors, the specimens acquire considerable added value. When crystals of a black, white or colorless mineral are accompanied by crystals of other, more colorful minerals, a similar value-added effect occurs.

Transparency and Translucency

Most non-metallic minerals are capable of forming crystals which are translucent, at least on their thin edges, and a smaller number of minerals can form crystals which are completely transparent. In general, the greater the degree of transparency or translucency which a crystal shows, the more highly prized it is. Some Westerners collect only crystals which are completely transparent, or (as we say) "gemmy." Such crystals, for example emerald, tourmaline and topaz, are not only prized by crystal collectors for their specimen value but are also prized by gem cutters for their potential value as faceted gemstones. "Gem" crystals like these, especially when brightly colored, are held to be extremely valuable in both ways, their gem value boosting their specimen value (and price) by several times at least. Rare and unusual species, when they are colorful, well-crystallized and gemmy, make for the most highly prized of all mineral specimens in the West, even though their crystals are most commonly small; examples of species with this potential include scheelite, proustite and scorodite.

Fluorite on drusy quartz, 24.5 cm, from the De'an mine, Jiangxi Province, China. This is an excellent specimen because it has (l) good crystal size, (2) well-formed crystals, (3) a focal-point crystal larger than the others, (4) bright, clean color, (5) attractive color contrast between fluorite and quartz, (6) good transparency/translucency of crystals, (7) aesthetic sculptural shape overall and (8) freedom from damage. The only shortcoming is the luster of the faces, which are somewhat rough rather than mirror-bright (although typical for this location).

Luster

A high degree of light reflectivity from crystal faces is a very valuable characteristic of any mineral; miners sometimes call this property "shine." For non-metallic species a glass-like shininess is important; and for metallic species, which cannot be translucent or transparent, the degree of metal-like shininess, or metallic luster, is extremely important. A highly lustrous crystal of a metallic mineral such as acanthite or bournonite can be worth as much as a gem crystal of emerald or topaz. But—and this is important—the luster must be entirely natural and not enhanced by polishing, oiling or chemical treatment.

Specimen Aesthetics: *Loose Crystals*

In this and the next two sections we look at the overall aesthetic harmony, balance and "sculptural" shape of mineral specimens. This quality is hard to quantify or describe; it can only be apprehended as an aesthetic whole. Some Western collectors like single crystals, that is, individual crystals which show no trace of the rock or mineral layers (called "matrix") on which they originally grew. In German, matrix is called *Muttergestein* ("mother rock"): we sometimes use this term to describe the host rock to miners and people new to collecting, as Herb Obodda famously did in Pakistan in the 1970s.

Among single crystals free of the "mother rock" the most highly prized are those which display the symmetrical, textbook-like, ideal shape of the mineral, without distortions or any broken points where the crystals had been attached to matrix. Such complete, loose, individual crystals are called "floaters" and can have a premium price. Species that do occur on matrix, such as tourmaline, must be spectacular to be considered desirable if lacking matrix. Others, such as tanzanite, rarely occur on matrix at all, and so singles are expected and in fact desired as the "standard" type of specimen for those species.

Specimen Aesthetics: *Crystal Clusters*

Many mineral specimens are clusters of two or more crystals with no rock matrix attached. Among these, the most desirable are clusters with one or two sharp crystals which are much larger than the others and thus form "focal points" to which the eye naturally goes on first glance. We call this "dominant crystal aesthetics." Crystal clusters showing these focal points are judged superior to clusters with many crystals which are all of about the same size, even when in large groups. The more prominent and well-centered the focal-point crystals are in the cluster, the more aesthetically fine the specimen is judged to be.

Specimen Aesthetics: *Matrix Specimens*

When a specimen consists of a single crystal or a crystal cluster attached to matrix, we look for an aesthetic harmony between the size of the crystal or crystal cluster and the size of the matrix. Ideally the crystal or cluster should be at least half the size of the matrix; if the matrix area is too large in relation to the crystals on it, the specimen is less balanced. Also important, of course, is the harmony between the color of the crystals and the color of the matrix. A beautiful crystallized mineral with color, in balanced

Fluorite with quartz on matrix, 13 cm, from the Yaogangxian mine, Chenzhou Prefecture, Hunan Province, China. Found in 2009. This is one of the finest known fluorite specimens from China because it has (1) unusually large crystal size, (2) crystallized matrix, (3) well-formed crystals, (4) an extraordinary focal-point crystal well-positioned on top of the matrix, (5) rare and beautiful turquoise-blue color with faint purplish blue zones, (6) attractive color contrast between the fluorite and the white quartz, (7) excellent crystal transparency, (8) excellent crystal luster, (9) aesthetic sculptural shape overall, and (10) freedom from damage. It is a world-class specimen with no shortcomings.

proportion on top of a contrasting crystallized host matrix with a different color, is judged to be the best possible matrix specimen. It is acceptable for matrix to be carefully trimmed down and even sculpted into an aesthetic size and shape, as long as the surfaces look like natural breaks (and not, for example, flat sawed surfaces).

Physical condition of specimens

Experienced Western collectors typically do not tolerate any clearly visible damage to crystal specimens—especially on the smooth faces of crystals or on their terminations. “Damage” here means visible bruises, chips, broken areas or cleaved surfaces

Fluorite crystal cluster, 39 cm, from the Xianghualing mine, Chenzhou Prefecture, Hunan, China. Found in 2003. Although this one has not been treated, fluorite specimens such as this are very often coated with a thin layer of oil to "improve" the luster and facilitate sales. Many Chinese dealers consider this technique to be merely good business practice. Although surface oiling is relatively harmless (since it may be washed off), the oil may also penetrate cracks and give a false impression of transparency. Oiling is therefore considered unethical by Western standards.

Because the mineral-dealing history in China is relatively recent and many dealers are often not well educated in either the collecting or the appreciation of fine minerals, difficulties may arise when the native Chinese collectors and dealers try to sell to the Western markets. One troublesome aspect is that Chinese dealers have commonly been willing to "enhance" the quality of the specimens in various ways which scrupulous Western collectors regard as highly unacceptable and unethical.

For example, color-changing irradiation of specimens has become a common practice in China. For $5 per kilo, enterprising dealers can have minerals irradiated in medical facilities in Changsha. The technique is especially successful in changing pale colors in fluorite to intense greens or blues. Mediocre colorless or gray quartz from the Yaogangxian mine leaves the radiation chambers as "morion," a very dark smoky quartz. The dealers customarily swear that these specimens are completely "natural," and indeed they believe it to be the case using their definition of the term rather than the collector's definition.

Another problem is faked specimens, assembled from parts that did not originally grow together. Some years ago, glued-on cinnabar crystals flooded the markets, and many collectors and Western dealers worried about their effects on the market. The cinnabar of China had earned a good reputation early on, but suffered a disastrous decline in value because of this kind of faking.

Guanghua Liu

on the crystals, and it may also include unsightly broken areas on the matrix. A bruise or broken area on the prominent tip of a focal-point crystal, even if the damage is very small, may entirely destroy a specimen's market value; that is, it may make a specimen nearly worthless even though every other part of the specimen is damage-free. Therefore we encourage miners and field collectors to use extreme care in recovering specimens, and in packing them and wrapping them carefully in soft material, so as not to damage the crystals.

It is not acceptable for damage to be surreptitiously "fixed" or hidden by polishing or infilling with artificial substances unless that fact is disclosed honestly by the seller. Repairs and restorations are acceptable in some cases, depending on various factors such as the position of the repair or restoration, the significance of the specimen, and the skill of the preparator, but it must always be disclosed to potential buyers.

We live now in a golden age of mineral collecting, with worldwide interest being continually fueled by new discoveries of crystallized minerals—especially in countries, like China, which have only recently become known internationally for producing a wide range of specimen-quality minerals. Each collector, of course, will evolve his or her own tastes and priorities in collecting fine mineral specimens. Still, there has been a longstanding *cultural* difference between East and West in judging which qualities of a "stone" are important to appreciate. While mineral collectors and museums in China and the West may have had somewhat different priorities, it is hoped that this attempt to describe how minerals are evaluated "in Western eyes" will contribute to broader cross-cultural understanding. Indeed it is hoped that this book will particularly inspire Chinese readers and miners to become even more fully informed members of the *international* community of those who value minerals for both art and educational purposes, and thus will encourage them to preserve and share these treasures from the ground.

Thomas Moore *and* **Robert Lavinsky**

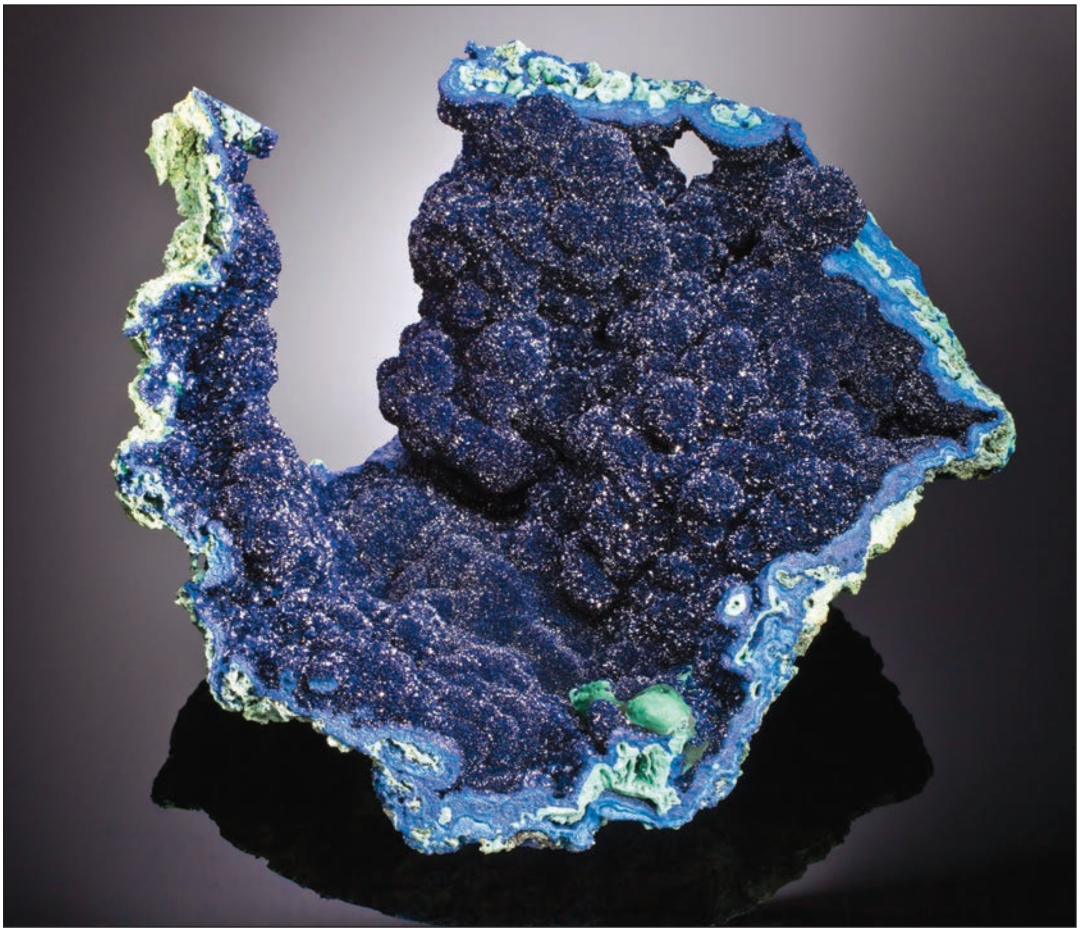
Thomas P. Moore, a mineral collector since childhood, began collecting in southeastern Pennsylvania. While in college he worked as a curatorial assistant, organizing, curating and augmenting the Irénée Dupont mineral collection at the University of Delaware (where he carried a double major in Geology and English). He received his Master of Fine Arts Degree in Creative Writing from Cornell University in 1975, and taught English for the University of Maryland in Germany for 15 years. Since 1986 he has written some 20 feature-length articles and more than 100 book reviews and reports on major mineral shows for the Mineralogical Record. *Returning to the U.S. in 1991, he taught at various universities and colleges before being hired as staff editor for the* Mineralogical Record *in 2001.*

安徽

ANHUI PROVINCE

The Huangshan Mountains in southern Anhui Province, one of China's major tourist destinations.
Photo © Dimdok.

In Anhui Province, 140 mineral deposits have been discovered, 67 of which now have proven ore reserves and, of these, 49 are now being actively mined. Thirty-eight of the ore deposits in Anhui Province rank among the country's largest in terms of reserves. Many fine copper minerals and associated species are found in the Chizhou and Lujiang mining areas.



Azurite, 29 cm, from Liufengshan mine, Guichi district, Chizhou Prefecture, Anhui Province, China. Found *ca.* 2002. Ex Bruce Oreck collection.

A pair of azurite and malachite slices, 7.7 cm tall, from the Liufengshan mine, Guichi district, Chizhou Prefecture, Anhui Province, China. Ex Ken Roberts collection.

福建
FUJIAN PROVINCE

View from the Tongbei mine in Fujian Province. Chen Wei Gang photo.

Geological surveys have identified 34 non-metallic and 45 metallic mineral deposits in Fujian province. Reserves of pyrophyllite, limestone, kaolin, alunite, granite, fluorite and tungsten are among the largest in the country. The quartz and garnet specimens from Yunxiao and Zhangpu are popular with mineral collectors worldwide.

Spessartine with smoky quartz, 46 cm, from the Wushan mine, Tongbei, Zhangzhou Prefecture, Fujian Province, China. Collected *ca*. 2005. Ex Mark Kielbaso collection.

Pyrite on spessartine, 30 cm, from the Wushan mine, Tongbei, Zhangzhou Prefecture, Fuijan Province, China. Ex Chen Wei Gang collection.

(below and left)
Spessartine with smoky quartz on feldspar, 18 cm, from the Wushan mine, Tongbei, Zhangzhou Prefecture, Fujian Province, China. Collected *ca*. 2005. Ex Chen Wei Gang collection.

Spessartine on decomposed granite, 14.5 cm, from the Wushan mine, Tongbei, Zhangzhou Prefecture, Fujian Province, China. Collected in 1998; ex Daniel Trinchillo/Marcus Budil collection.

广东
GUANGDONG PROVINCE

Scenic Danxia Mountain in northern Guangdong Province. Photo © Stary Stary.

Over 100 mineral deposits have been discovered in Guangdong Province, 89 of which have been studied geologically. Deposits of lead, bismuth, silver, tin, niobium, tantalum, Iceland spar and zinc are the most abundant, playing an important role in provincial industrial development. The Pingtouling mine in Liannan, the Shilu mine in Yangchun, and the Yangshan and Ruyuan mines are famous as specimen producers.

(*above*) Malachite, 24 cm, from the Shilu mine, Yangchun County, Yangjiang Prefecture, Guangdong Province, China.

(*left*) Malachite, 33 cm, from the Shilu mine, Yangchun County, Yangjiang Prefecture, Guangdong Province, China.

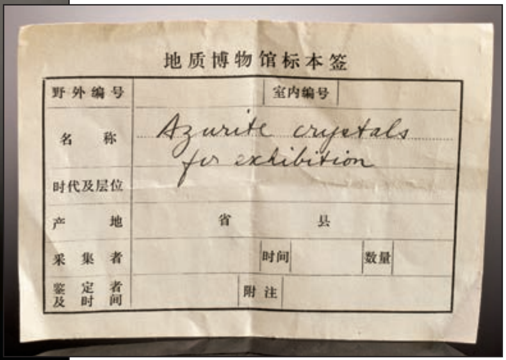
(*right*) Malachite, 23.5 cm, from the Shilu mine, Yangchun County, Yangjiang Prefecture, Guangdong Province, China.

All specimens mined *ca*. mid-1980s.

Quartz crystal cluster, colored red by microscopic hematite inclusions, with hematite crystals on matrix, 21.5 cm, from Jinlong Hill, Longchuan County, Heyuan Prefecture, Guangdong Province, China. Ex James Horner collection. Guanghua Liu found this specimen on a trip in 1995.

Mimetite crystals on limonite matrix, 13.5 cm, from the Pingtouling mine, Liannan County, Qingyuan Prefecture, Guangdong Province, China. From the first major find in 2001.

Azurite, 14 cm, from the Shilu mine, Yangchun County, Yangjiang Prefecture, Guangdong Province, China. This specimen was exhibited at the 1980 Tucson show by the Beijing Geological Museum.



地质博物馆标本签

野外编号		室内编号			
名称	Azurite crystals for exhibition				
时代及层位					
产地	省	县			
采集者		时间		数量	
鉴定者及时间		附注			

广西
GUANGXI ZHUANG A. R.

The Yulong River near the Yangshuo mine. Photo © Mikhail Nekrasov.

Bordering Vietnam, the Guangxi Zhuang Autonomous Region has a unique topography of karst caves and spectacular natural features that attract tourists from all over. The province is a key production center for non-ferrous metals and contains over a third of all of China's tin and manganese deposits. Famous mineral localities in the province include the Daoping lead mine, the Dafeng kermesite occurrence and the Dachang tin-polymetallic orefield.

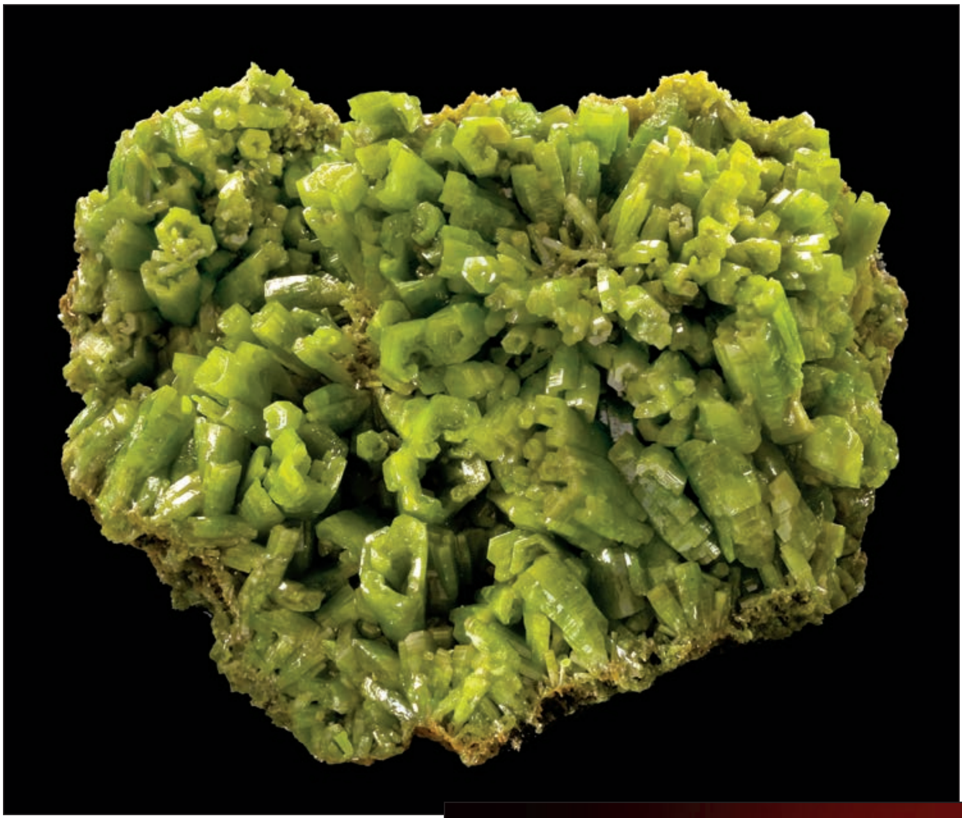
Calcite "heart twin," 26 cm, from the Babu district, Hezhou Prefecture, Guangxi Zhuang Autonomous Region, China. Found in 1998.

Calcite "heart twin," 13.9 cm, from the Babu district, Hezhou Prefecture, Guangxi Zhuang Autonomous Region, China. Found in 1998.

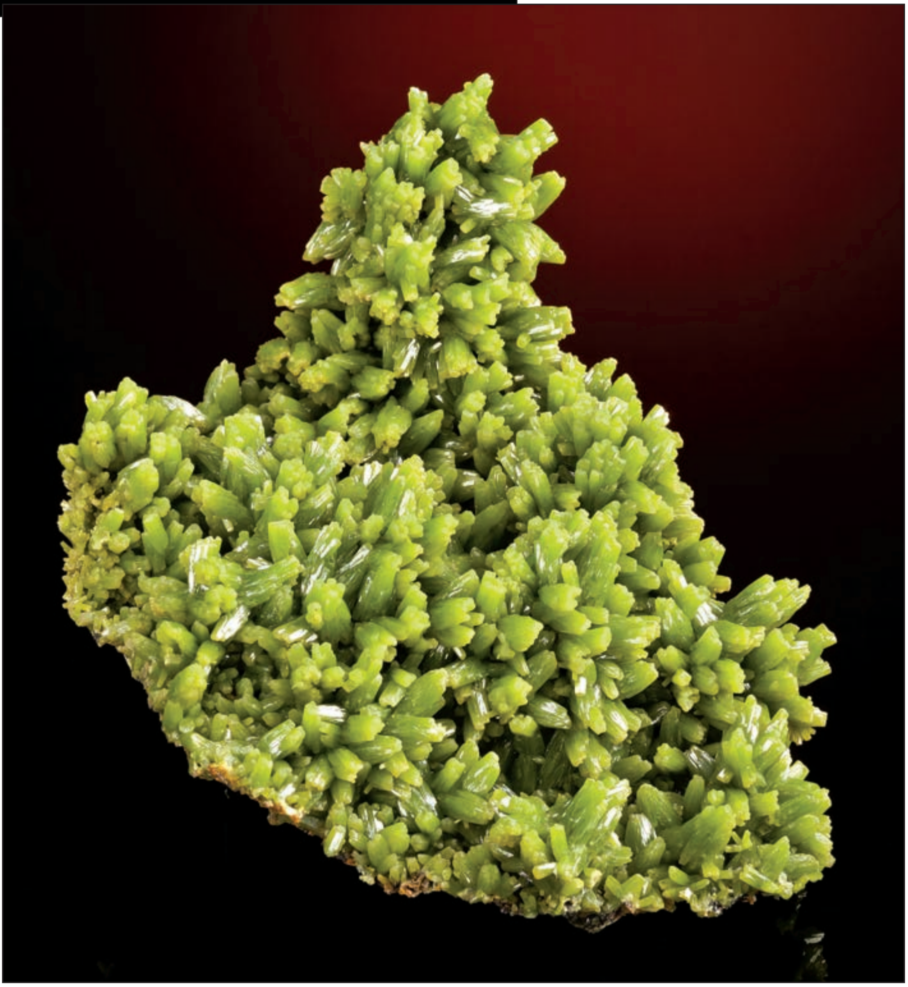
Calcite on stibnite, 20 cm, from the Dachang mine, Nandan County, Hechi Prefecture, Guangxi Zhuang Autonomous Region, China.

Rhodochrosite, 23 cm, from the Wutong mine, Liubao, Cangwu County, Wuzhou Prefecture, Guangxi Zhuang Autonomous Region, China. From the 2009 finds.

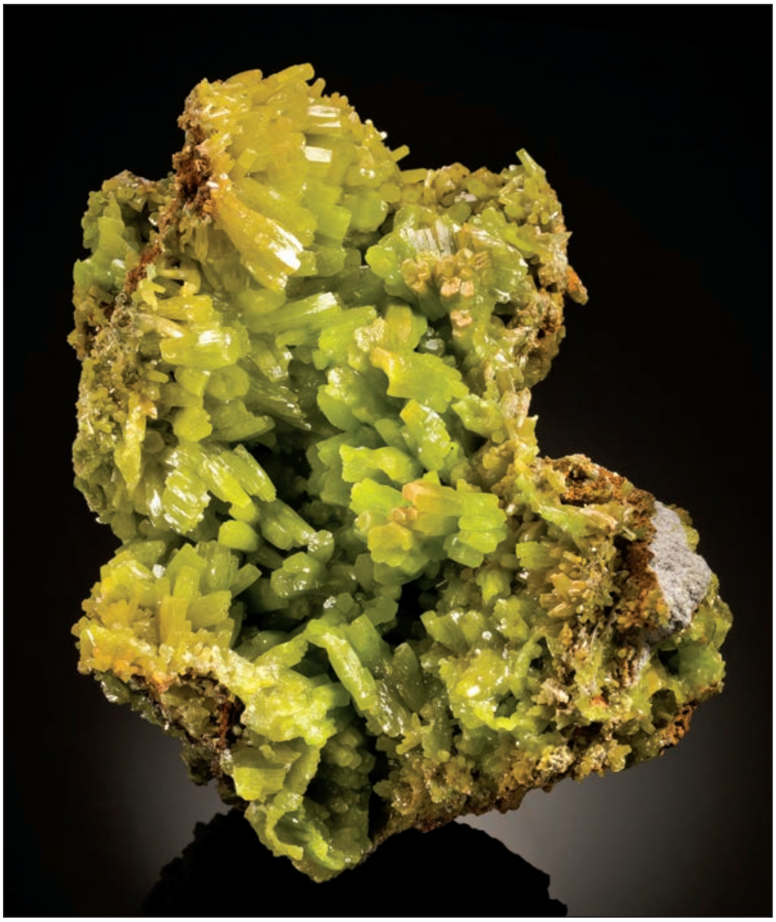
Rhodochrosite with fluorite, 18 cm, from the Wutong mine, Liubao, Cangwu County, Wuzhou Prefecture, Guangxi Zhuang Autonomous Region, China. Gail and Jim Spann collection; Tom Spann photo. Found in 2009.

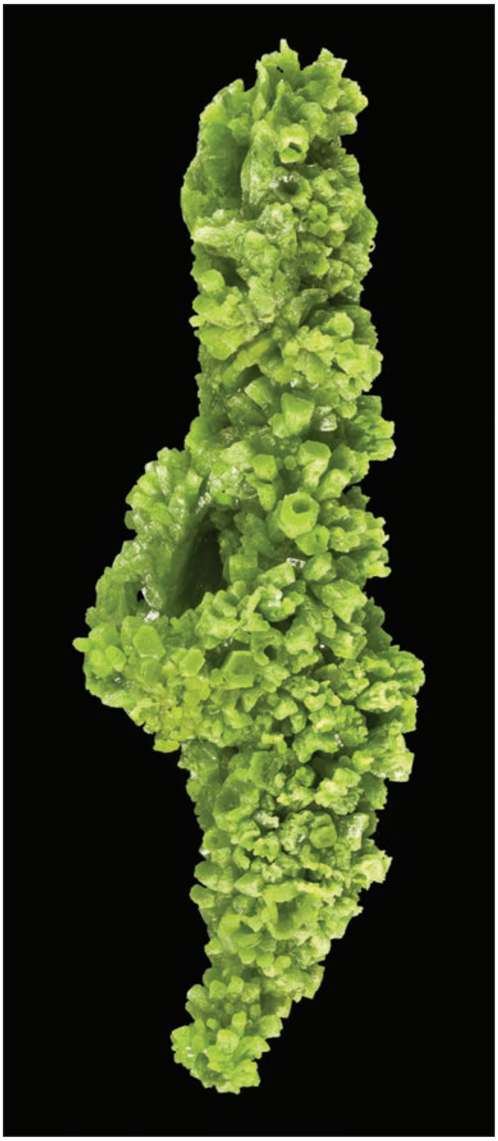


Pyromorphite crystal cluster, 14.3 cm, from the Daoping mine, Gongcheng County, Guilin Prefecture, Guangxi Zhuang Autonomous Region, China. Ex Norm and Roz Pellman collection, from the 2000 pocket.

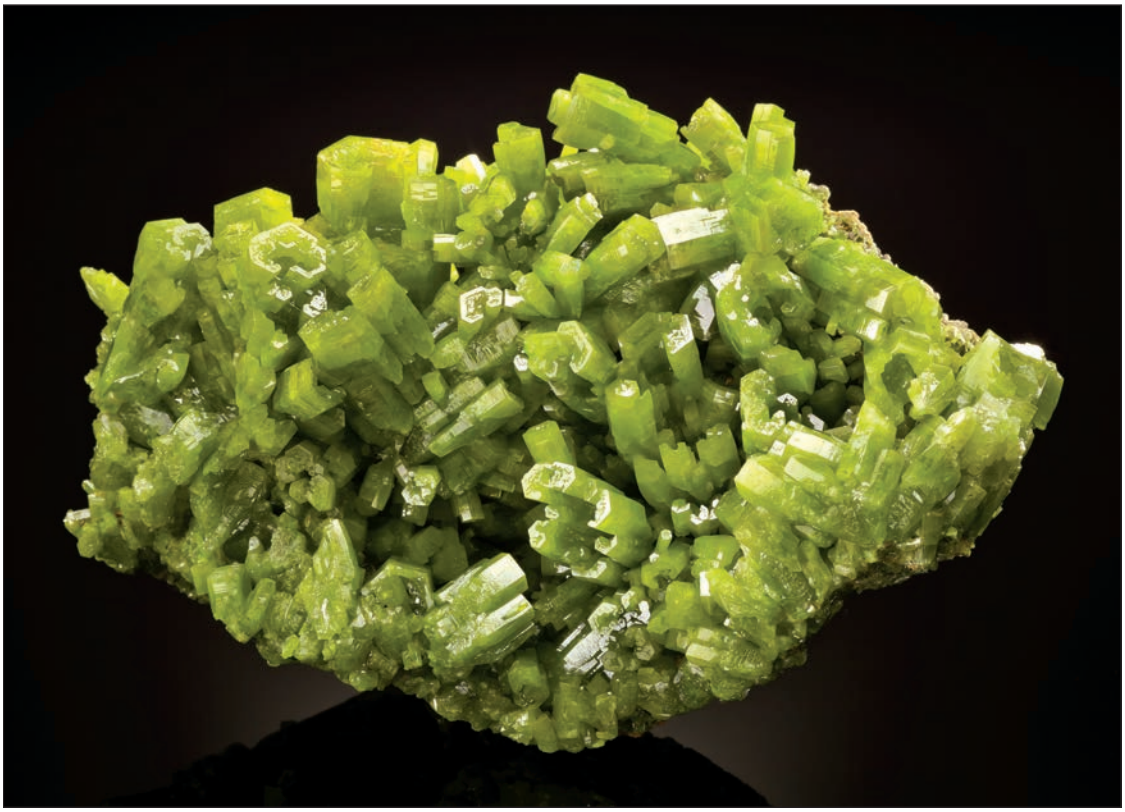


Pyromorphite crystal cluster, 14 cm, from the Daoping mine, Gongcheng County, Guilin Prefecture, Guangxi Zhuang Autonomous Region, China. Found circa 2003.





Three pyromorphite crystal clusters: (top) 13.6 cm, found in 2000; ex Steve Smale collection; (left) 14.5 cm, found in 2009; (right) 16.5 cm, a unique large stalactite, found in 2010; from the Daoping mine, Gongcheng County, Guilin Prefecture, Guangxi Zhuang Autonomous Region, China.



Two pyromorphite crystal clusters: (*top*) 11.5 cm, from the 2000 pocket; ex Steve Smale collection; (*bottom*) a rare matrix piece, 11 cm, from the 2003 pocket; ex Sandor Fuss and Steve Smale collections; from the Daoping mine, Gongcheng County, Guilin Prefecture, Guangxi Zhuang Autonomous Region, China.

贵州
GUIZHOU PROVINCE

The picturesque karst mountain landscape of Guizhou Province. Photo © Jun Mu.

Guizhou is characterized by high elevation and mountainous geography. Geologic studies have revealed 14 mineral deposits in Guizhou Province, in which the reserves of mercury, manganese, aluminum and antimony are the third largest in China. Although there is considerable mining going on there, collectible minerals are only known from the Wanshan-Tongren, Qinglong and Dushan mining areas.

Cinnabar on dolomite, 7.3 cm, from the Dadongla (Yunchangping) mine near Tongren Prefecture, Guizhou Province, China. Found in 2006.

Cinnabar on dolomite, 6.5 cm, from the Dadongla (Yunchangping) mine near Tongren Prefecture, Guizhou Province, China.

湖北
HUBEI PROVINCE

Dawn in the Shennongjia Mountains. Photo © xfdly.

Hubei Province is situated along the middle reaches of the Yangtze River, north of Dongting Lake. Hubei has some of the largest ore reserves in China; they include deposits of phosphorus, clay minerals, bromine, iodine, copper, gypsum, limestone and barite. The Daye area has a history of mining going back over 3,000 years, and mines are still active there today. The Tonglushan and Fengjiashan mines in Daye County have been important specimen producers.

Calcite crystal, 15 cm, from the Fengjiashan mine, Daye County, Huangshi Prefecture, Hubei Province, China. An apparently unique specimen with intense color (thought to be caused by trace amounts of manganese); found near the 2008 pocket.

Calcite crystal on calcite crystals, 13 cm, from the Fengjiashan mine, Daye County, Huangshi Prefecture, Hubei Province, China. Found in 2008.

Pyrite crystal with Japan-law quartz, 14.5 cm, from the Fengjiashan mine, Daye County, Huangshi Prefecture, Hubei Province, China. Found *ca*. 2005.

Amethyst, 40 cm, from the Guanmenshan copper deposit, Shenlongjia, Forest District, Hubei Province, China. Found *ca.* 2008.

Amethyst with calcite crystals, 11 cm, from the Fengjiashan mine, Daye County, Huangshi Prefecture, Hubei Province, China. Ex Steve Smale collection.

Inesite on matrix, 15 cm, from the Fengjiashan mine, Daye County, Huangshi Prefecture, Hubei Province, China. Found *ca*. 2005.

Inesite on matrix, 13 cm, from the Fengjiashan mine, Daye County, Huangshi Prefecture, Hubei Province, China. Found *ca*. 2000.

湖南
HUNAN PROVINCE

A scenic view of the Yaoganxian Mountain. Xiaojun Chen photo.

Hunan has long been known for its abundant mineral resources and natural beauty. There are over 6,000 non-ferrous mines in the province, some of which have produced exceptional mineral specimens. Important localities include the Shimen realgar mine and the Xikuangshan antimony mine in the northern and central districts, the Shangbao pyrite mine, the Leiping polymetallic mine, the famous Yaogangxian tungsten mine, the Xianghualing and Xianghuapu tin-tungsten mines and the Dongshan tungsten mine in southern Hunan.

Calcite with oriented pyrite microcrystals, 44 cm, from Chenzhong, Hunan Province, China. This is probably the largest complete specimen from the pocket found in 2008–2009.

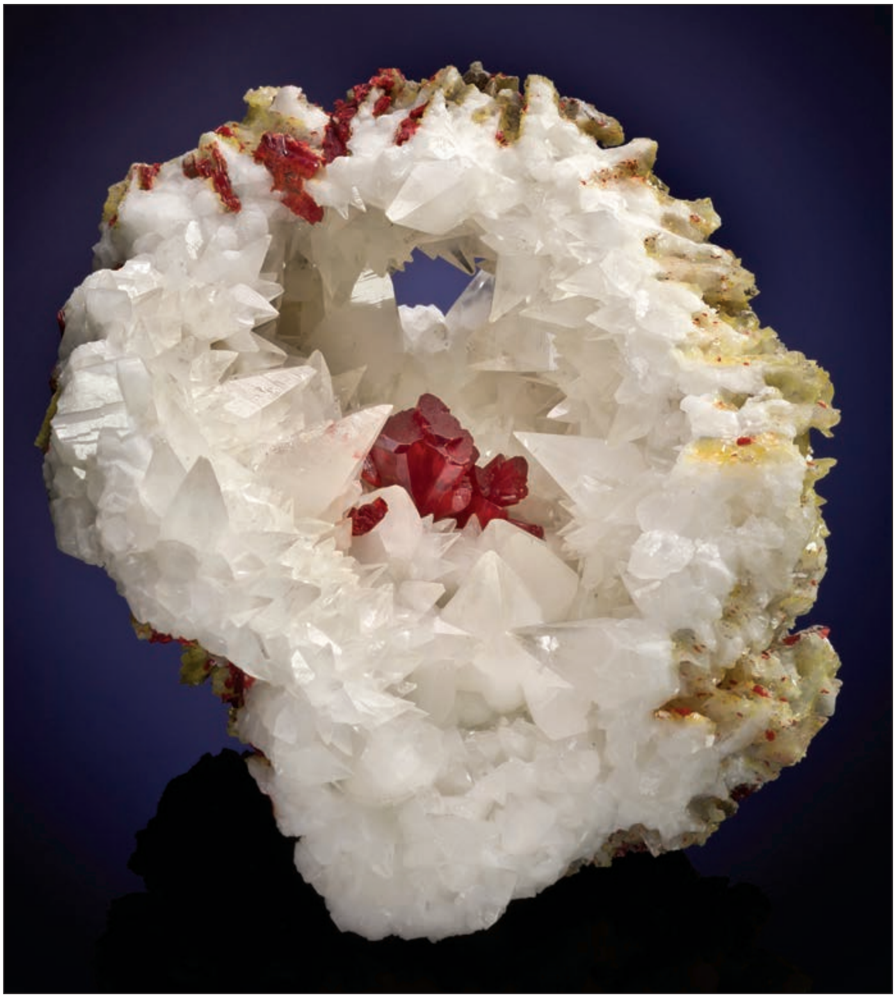
Calcite twins on matrix, 25.5 cm, from the 884 mine, Leiping, Guiyang County, Chenzhou Prefecture, Hunan Province, China. Found in 1998.

Calcite with pyrite, 27.5 cm, from Chenzhong, Hunan Province, China. Found *ca*. 2009.

Calcite with pyrite microcrystals, 28 cm, from the Manaoshan mine, Chenzhou Prefecture, Hunan Province, China. Found *ca*. 2009.

Calcite with realgar, 27 cm, from the Jiepaiyu (Shimen) mine, Shimen County, Changde Prefecture, Hunan Province, China. Found *ca*. 2000; ex Daniel Trinchillo Sr. collection.

Orpiment, 12.7 cm, from the Jiepaiyu (Shimen) mine, Shimen County, Changde Prefecture, Hunan Province, China. Found in 2011.



Calcite with realgar, 16 cm, from the Jiepaiyu (Shimen) mine, Shimen County, Changde Prefecture, Hunan Province, China. Found *ca*. mid-2000s.

Orpiment with calcite, 20 cm, from the Jiepaiyu (Shimen) mine, Shimen County, Changde Prefecture, Hunan Province, China. Found in the late 1990s.

Realgar, 13 cm, from the Jiepaiyu (Shimen) mine, Shimen County, Changde Prefecture, Hunan Province, China. Found in the late 1990s; ex Steve Smale collection.

Stibnite, 16.5 cm, from the Xikuangshan mine (the world's largest antimony mine), Lengshuijiang County, Loudi Prefecture, Hunan Province, China.

Fluorite and pyrite, 21.5 cm, from Shangbao, Leiyang County, Hengyang Prefecture, Hunan Province, China.

Stibiconite pseudomorph after stibnite, 46 cm, from the Xikuangshan mine, Lengshuijiang County, Loudi Prefecture, Hunan Province, China. Found in the mid-1990s; ex James Horner collection.

Stibnite, 60 cm, one of the first to be exported to the West from the Xikuangshan mine, Lengshuijiang County, Loudi Prefecture, Hunan Province, China. It is nicknamed the "Don King stibnite" after the boxing promoter whose hairstyle it resembles. Found *ca.* mid-1990s. Rob Lavinsky photo; ex James Horner collection.

Spinel-twinned fluorite with inclusions of boulangerite needles, 10.9 cm, from the Yaogangxian mine, Yizhang County, Chenzhou Prefecture, China. Found in 2010.

Fluorite on quartz with bournonite, 16.3 cm, from the Yaogangxian mine, Yizhang County, Chenzhou Prefecture, China. Mined in 2003.

Macle-twinned fluorite on quartz with bournonite and included quartz, 15 cm, from the Yaogangxian mine, Yizhang County, Chenzhou Prefecture, China. Mined in 2003. This specimen and the one shown above-left were the largest of five twinned crystals recovered from this pocket.

Fluorite with calcite and quartz, 13.8 cm, from the Shangbao mine, Leiyang County, Hengyang Prefecture, Hunan Province, China. Found in 2011.

Fluorite with calcite and quartz, 16.5 cm, from the Shangbao mine, Leiyang County, Hengyang Prefecture, Hunan Province, China. Found in 1990.

Fluorite on quartz, 31 cm, from the Yaogangxian mine, Yizhang County, Chenzhou Prefecture, China.

(*facing page, top*) Fluorite, 29 cm, from the Xianghualing mine, Linwu County, Hunan Province, China.

(*facing page, bottom*) Fluorite on pyrite with quartz, 17 cm, found *ca*. 2010 in the Shangbao mine, Leiyang County, Hengyang Prefecture, Hunan Province, China.

Fluorite with calcite, 17.5 cm, from the Yaogangxian mine, Yizhang County, Chenzhou Prefecture, China. Mined in 2008.

Pink fluorite with quartz, dolomite and calcite, 24 cm, from the Shangbao mine, Leiyang County, Hengyang Prefecture, Hunan Province, China. Found *ca.* 2007.

Dolomite with pyrite, 13 cm, from the Shangbao mine, Leiyang County, Hengyang Prefecture, Hunan Province, China.

Fluorite with calcite, quartz and dolomite, 11 cm, from the Shangbao mine, Leiyang County, Hengyang Prefecture, Hunan Province, China. From the late 1990s.

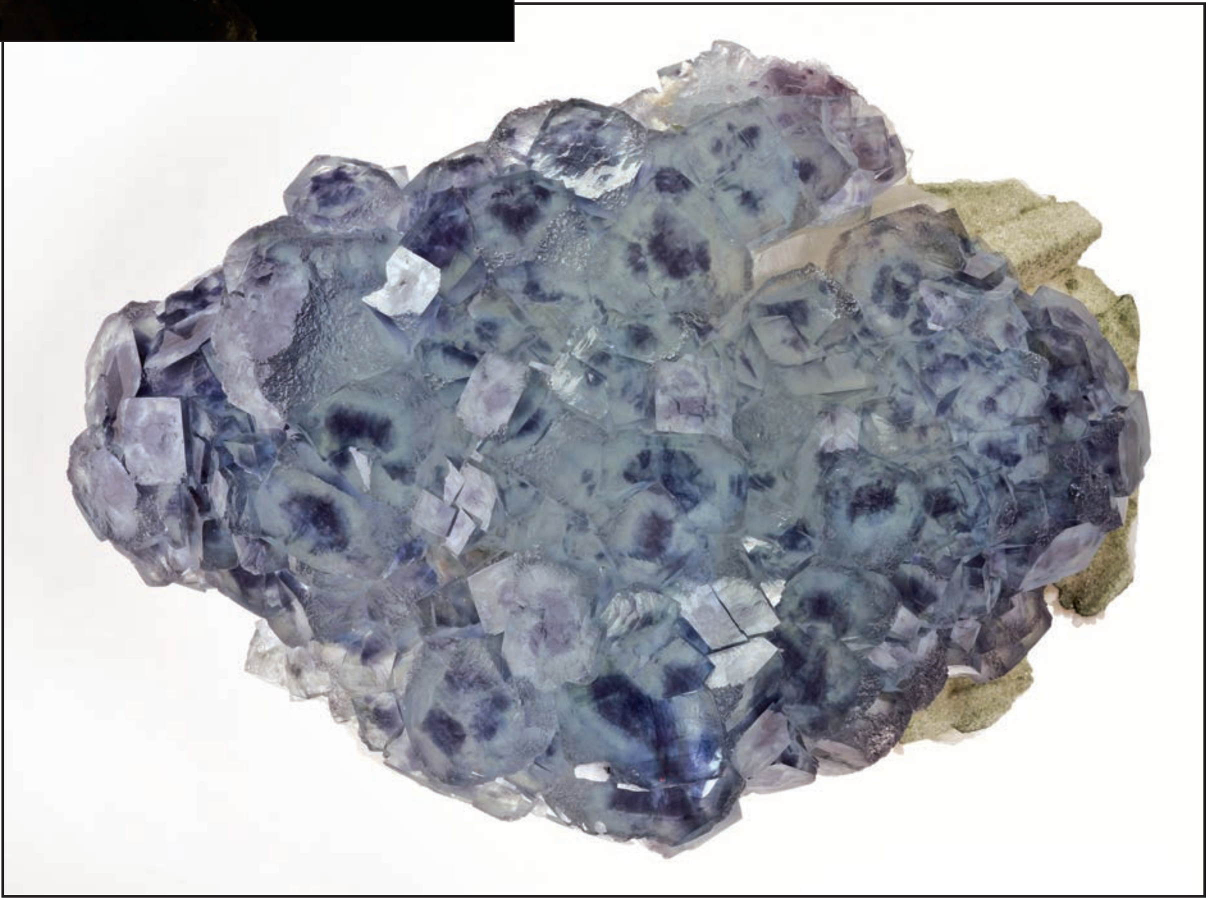
(*above*) Fluorite on quartz and calcite, 19.5 cm; (*left*) dolomite with fluorite and quartz, 26 cm; (*below*) quartz with bismuthinite, 12.8 cm; from the Shangbao mine, Leiyang County, Hengyang Prefecture, Hunan Province, China.

Pyrite with fluorite and quartz, 14.5 cm, from the Shangbao mine, Leiyang County, Hengyang Prefecture, Hunan Province, China.

Pyrite with quartz, 33 cm, from the Shangbao mine, Leiyang County, Hengyang Prefecture, Hunan Province, China. Found *ca*. 2008.

Iridescent arsenopyrite with quartz, 10.5 cm, from the Yaogangxian mine, Yizhang County, Chenzhou Prefecture, Hunan Province, China.

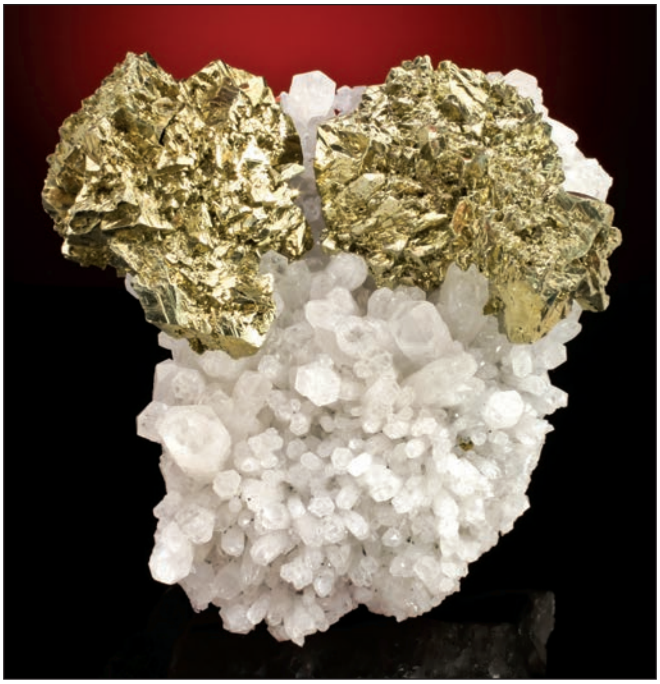
Fluorite, 24 cm, from the Yaogangxian mine, Yizhang County, Chenzhou Prefecture, Hunan Province, China. Found in 2011.



Sphalerite, 16 cm, from the Rucheng mine, Caojia, Nuanshui, Rucheng County, Chenzhou Prefecture, Hunan Province, China. Found in 2002.

Sphalerite with quartz, 18 cm, from the Rucheng mine, Caojia, Nuanshui, Rucheng County, Chenzhou Prefecture, Hunan Province, China. Found in 2006.

Ferberite with stannite and muscovite, 14 cm, from the Yaogangxian mine, Yizhang County, Chenzhou Prefecture, Hunan Province, China. Ex Ed David collection, from the late 1990s.



Chalcopyrite with quartz, 11 cm, from the Yaogangxian mine, Yizhang County, Chenzhou Prefecture, Hunan Province, China.

Bournonite with quartz, 8.7 cm, from the Yaogangxian mine, Yizhang County, Chenzhou Prefecture, Hunan Province, China.

Fluorite on quartz, 25.3 cm, from the Taolin mine, Linxiang County, Yueyang Prefecture, Hunan Province, China. Ex Marc Weill collection; an old specimen from the early 1990s.

Calcite (cuprian), 20 cm, from the Shuikoushan mine, Shuikoushan ore field, Changning County, Hengyang Prefecture, Hunan Province, China.

内蒙
INNER MONGOLIA A.R.

Inner Mongolia is a sparsely populated region sandwiched between the People's Republics of Mongolia and China. Many rural people still live in the traditional Mongolian yurt tents made of colorful fabric or yak hides. The mines here have been in operation for decades, but until recently almost no specimens reached the market, and consequently it was assumed that the Inner Mongolian deposits long known for their politico-economic importance for rare earth elements simply did not produce good specimens. The truth was, however, that the miners simply did not know of the outside market or the value of specimens, and so they did not bother saving any. As of 2006, when Dr. Guanghua Liu published his book, *Fine Minerals of China*, Inner Mongolia was not known as a source of specimens and was not mentioned. Specimens finally began emerging in late 2007.

The Huanggang deposit has the potential to become one of China's most productive mineral occurrences for specimens, rivaling the Dalnegorsk deposits in Russia and the famous Yaoganxian and Shangbao deposits in Hunan Province. Because the education of the Huanggang miners has progressed so rapidly, and the dealers involved are expediting specimens to market so quickly, this locality is becoming the first "Internet age" Chinese mine; minerals are flowing from the mine to the market in better quality, greater quantity, and in less time than ever before at other Chinese mines. In the Huanggang area, as in many other mining districts, the new mineral specimen economy will fundamentally change the lives of many of the miners. And for collectors, this abundance presents a fine opportunity to collect specimens from a plentiful new locality at the start of its heyday.

Borcarite crystal group, 12.5 cm, from Huanggang mine No. 3, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. From a 2010 pocket. The small white crystals were determined to be cahnite by Paul Pohwat of the Smithsonian Institution—the first new locality for the species in 100 years.

Apophyllite-(KF), 11 cm, from the No. 2 tunnel, Chaobuleng mine, Dongwuzhumuqin County, Xilinguole Prefecture, Inner Mongolia Autonomous Region, China. Found in 2011. (Now often wrongly attributed to the Huanggang complex.)

Fluorite with löllingite, 13 cm, Huanggang mine No. 1, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in 2012.

Pink fluorite, 18 cm, from Huanggang mine No. 1, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. This habit was found in 2010. Most larger specimens were destroyed in the collecting process, before the miners learned how to collect them undamaged. This is the largest pink fluorite cluster that was preserved undamaged.

(*above*) Fluorite, 12 cm, from Huanggang mine No. 5, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in early 2012.

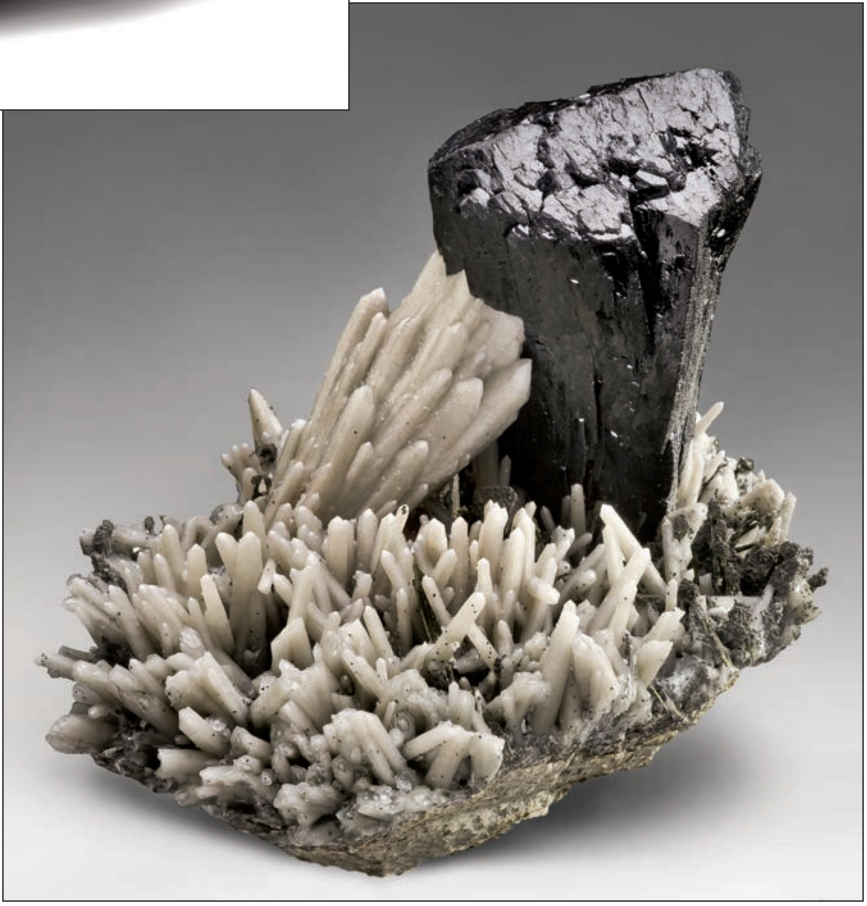
(*above right*) Fluorite crystals on calcite, 17 cm, from Huanggang mine No. 5, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in 2011.

(*right*) Fluorite crystal, 5 cm, on quartz, from Huanggang mine No. 1, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in 2011.

Arsenopyrite crystal group, 15 cm, from the Huanggang mine, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in 2010.

Arsenopyrite crystal group on ilvaite, 12.7 cm, from the Huanggang mine, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in 2011.

Purple scheelite crystal, 6.5 cm, from Huanggang mine No. 5, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in April 2012.



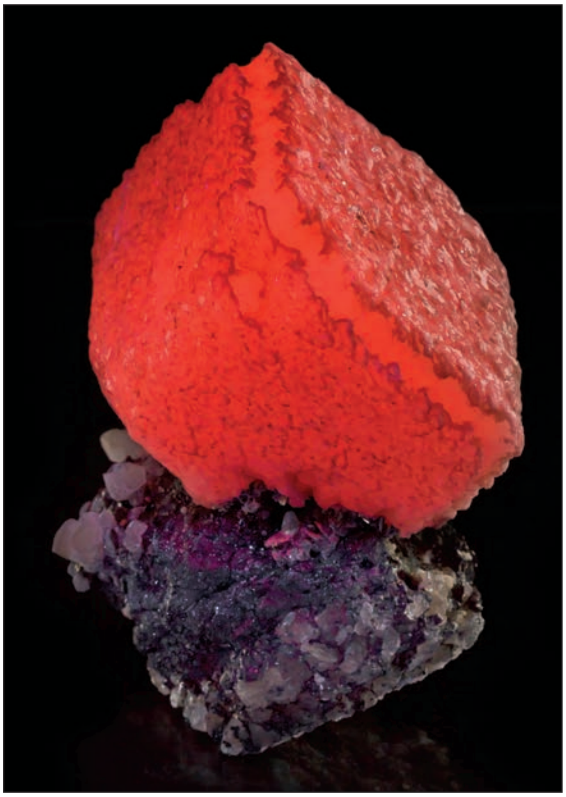
Ilvaite with quartz, 12.5 cm, from Huanggang mine No. 1, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in 2010.

Gem sphalerite crystal on colorless fluorite, 3.2 cm, from the Huanggang mine, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in 2012.

(*below right*) Ilvaite crystals, 16 cm, from Huanggang mine No. 1, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in 2011.

(*below*) Sphalerite crystal group, 5.6 cm, from the Huanggang mine, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in 2012.

(*above*) Pink calcite crystal group, 33 cm, from Huanggang mine No. 5, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. This calcite fluoresces deep red under ultraviolet light, like the specimen shown below. Found in 2010.



(*above under normal light and at right under fluorescent light*) Pink calcite crystal group, 16.5 cm, from Huanggang mine No. 5, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Province, China. Found in 2011.

Calcite with quartz, 15 cm, from Huanggang mine No. 5, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in 2011.

Calcite with quartz, 12 cm, from Huanggang mine No. 5, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in 2012.

Calcite with quartz, 24 cm, from Huanggang mine No. 5, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in 2011.

Twinned calcite with colorless fluorite, 12.7 cm, from Huanggang mine No. 5, Keshiketeng County, Chifeng Prefecture, Inner Mongolia Autonomous Region, China. Found in 2012.

江西
JIANGXI PROVINCE

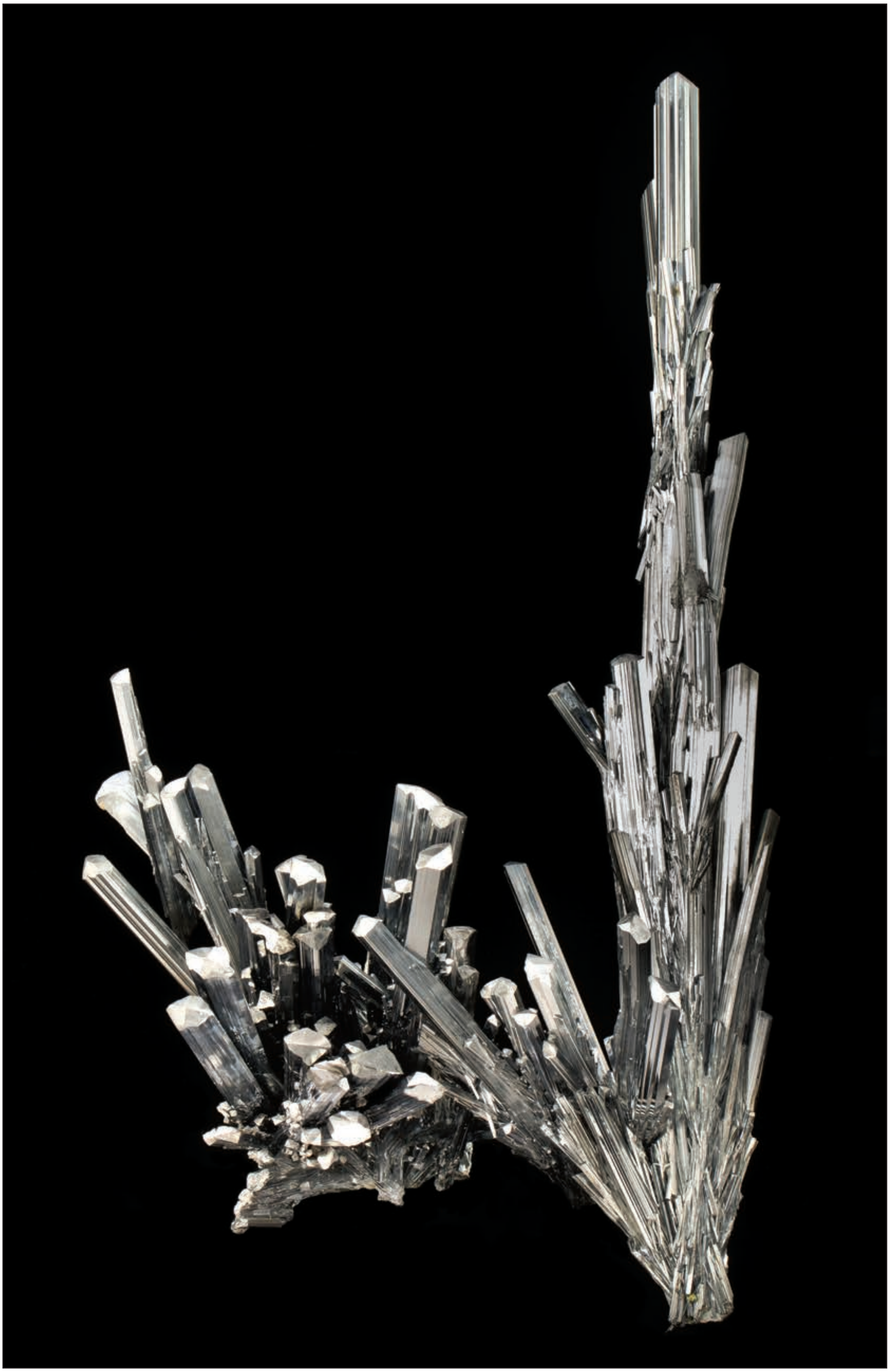
The scenic Danxia landscape was added to the UNSECO World Heritage List in 2010. Photo © zhu difeng.

Jiangxi Province is rich in copper, lead, tin and zinc deposits exploited by about 1,500 mines of different sizes The Dexing copper mine and the Xihuashan tungsten mine at Dayu are the largest mines of their kind in Asia. During the last five years, fantastic minerals including colorful fluorites, superb stibnites, and wonderful copper minerals have repeatedly been found in the mines of Jiangxi. The specimens from the De'an, Wuning, Jiujiang and Dayu mining areas are well known among collectors world-wide.

(*left*) Fluorite, 21.5 cm, from the De'an fluorite mine, Wushan, De'an County, Jiujiang Prefecture, Jiangxi Province, China.

(*below left*) Copper, 17.5 cm, from the Chengmenshan mine, Jiujiang County, Jiujiang Prefecture, Jiangxi Province, China. Found *ca*. 2005.

(*below*) Stibnite, 33 cm, from the Wuling mine, Qingjiang, Wuning County, Jiujiang Prefecture, Jiangxi Province, China. Found 2002.

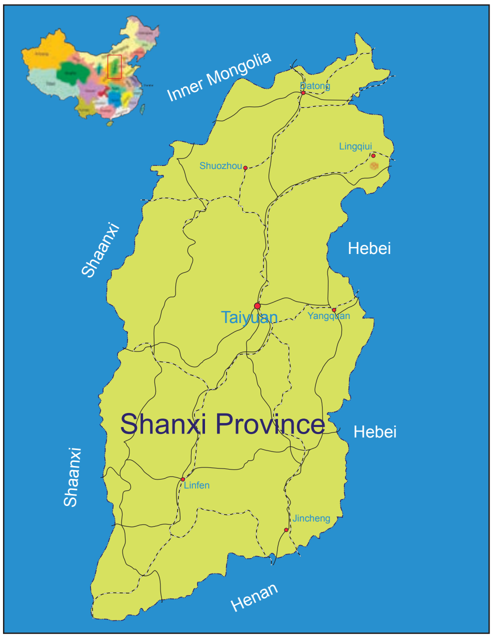


Stibnite, 37.5 cm, from the Wuling mine, Changde Prefecture, Jiangxi Province, China. Collected in 2002; ex Bruce Oreck collection.

Quartz pseudomorph after calcite on green fluorite, 13 cm, from the Xiefang mine, Ruijin County, Ganzhou Prefecture, Jianxi Province, China.

Fluorite (two habits), 17.5 cm across, from the De'an fluorite mine, Wushan, De'an County, Juijiang Prefecture, Jianxi Province, China. Ex Steve Neely collection.

山西
SHANXI PROVINCE



Huashan Mountain, one of China’s five Sacred Mountains, with the famous Chess Pavillion. Photo © Meiqianbao.

Shanxi has about a third of China‘s total coal reserves, with an annual production exceeding 300 million metric tonnes. Shanxi also has about 500 million tonnes of bauxite deposits, roughly a third of total Chinese reserves. Many private corporations, operating jointly with state-owned companies, have invested billions of dollars in the mining industry of Shanxi Province . Foreign investors include mining companies from Canada, the United States, Japan, the United Kingdom, Germany and Italy.

Acanthite and silver from the Hongda mine, Lingqiu County, Datong Prefecture, Shanxi Province, China. (*above*) 11.1 cm, (*below*) 9.7 cm, (*right*) 15.5 cm, (*below right*) 13 cm.

四川
SICHUAN PROVINCE

The summit of mount Minya Konka. Photo © Aleksandr Sadkov.

Sichuan Province, home of the giant panda, has developed over 100 metallic mineral deposits. Their reserves of vanadium and titanium are ranked highest in the country. The specimens of Mount Xuebaoding near Pingwu, Jinkouhe at Leshan, Meigu and Mianning are widely known, either for their aesthetic appearance or for their unusual mineral associations.

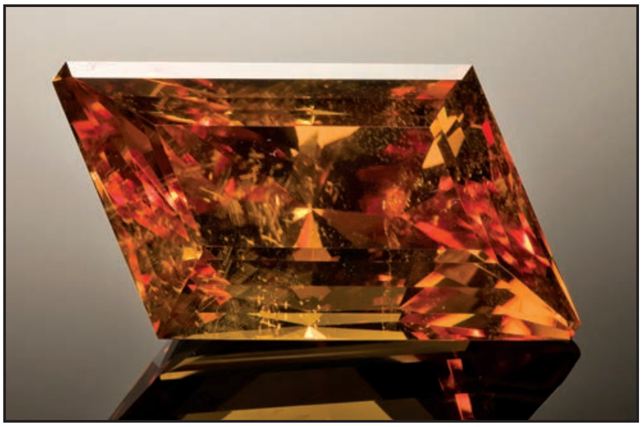
Aquamarine on muscovite, 20 cm, from the Pingwu mine, Huya Township, Mt. Xuebaoding, Pingwu County, Mianyang Prefecture, Sichuan Province, China. Found in 1998; ex Steve Smale collection

Aquamarine with cassiterite, 9 cm, (*left*) and cut stone, 23 cts. (*below*), from the Pingwu mine, Huya Township, Mt. Xuebaoding, Pingwu County, Mianyang Prefecture, Sichuan Province, China.

(*right*) Cassiterite on muscovite, 13.6 cm, from the Pingwu mine, Huya Township, Mt. Xuebaoding, Pingwu County, Mianyang Prefecture, Sichuan Province, China. Found *ca*. late 1990s; ex Daniel Trinchillo collection.

Scheelite crystal on muscovite, 17 cm, from the Pingwu mine, Huya Township, Mt. Xuebaoding, Pingwu County, Mianyang Prefecture, Sichuan Province, China. Found *ca*. 2000; ex Bruce Oreck collection.

Scheelite crystal with cassiterite, 13 cm, from the Pingwu mine, Huya Township, Mt. Xuebaoding, Pingwu County, Mianyang Prefecture, Sichuan Province, China. This is an early specimen from the mid 1990s; ex Steve Smale collection.



Faceted scheelite gemstone, 385 cts. (77 grams), from the Pingwu mine, Huya Township, Mt. Xuebaoding, Pingwu County, Mianyang Prefecture, Sichuan Province, China. Rough found in 1998; ex Daniel Trinchillo collection.

(*facing page*) Scheelite with quartz on muscovite (*top*), 13 cm, found in the late 1990s; ex Jack Halpern collection, and scheelite crystals on matrix (*below*), 16.5 cm, shown in incandescent and fluorescent light, found in 2006; from the Pingwu mine, Huya Township, Mt. Xuebaoding, Pingwu County, Mianyang Prefecture, Sichuan Province, China.

Cassiterite and aquamarine on muscovite, 18 cm, from the Pingwu mine, Huya Township, Mt. Xuebaoding, Pingwu County, Mianyang Prefecture, Sichuan Province, China. Ex Marc Weill collection.

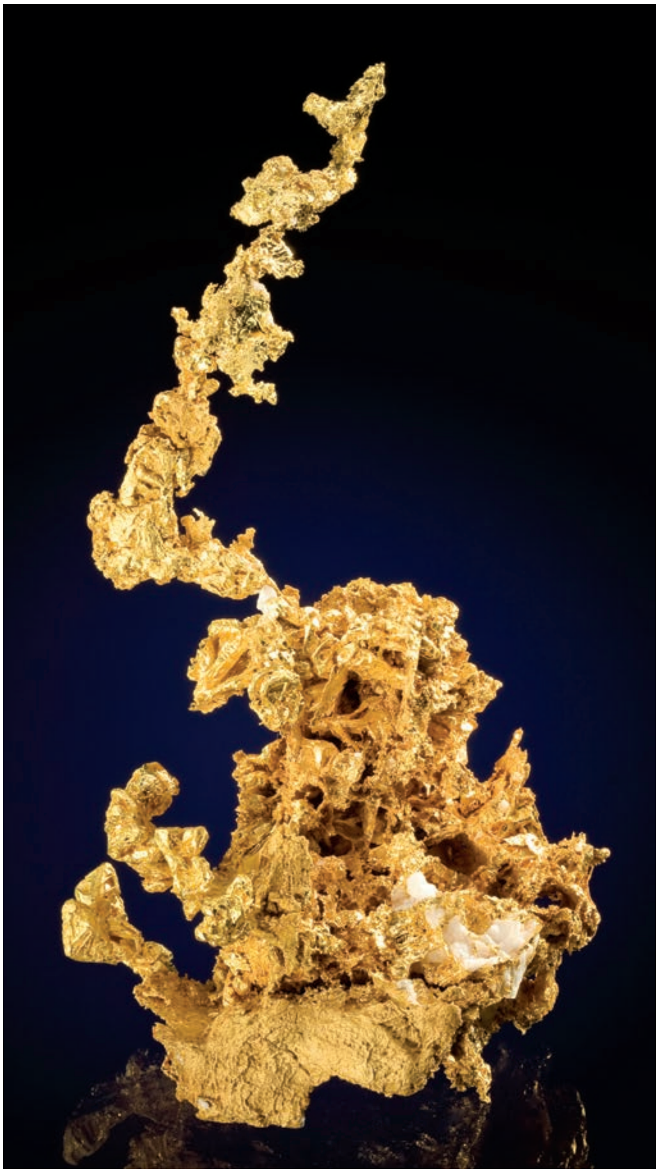
Aragonite colored by copper, 31 cm, from Maoniuping, Mianning County (adjacent to Xichang County, originally cited as the locality), Liangshan Autonomous Prefecture, Sichuan Province, China.

Fluorite crystal on muscovite, 21.6 cm, from the Pingwu mine, Huya Township, Mt. Xuebaoding, Pingwu County, Mianyang Prefecture, Sichuan Province, China.

Scheelite crystal with exceptional color, 10.5 cm, with faceted scheelite gemstones, from the Pingwu mine, Huya Township, Mt. Xuebaoding, Pingwu County, Mianyang Prefecture, Sichuan Province, China. From the "Red Pocket" 2008.

Aquamarine crystal with muscovite, 12 cm, from the Pingwu mine, Huya Township, Mt. Xuebaoding, Pingwu County, Mianyang Prefecture, Sichuan Province, China.

Native gold specimens from the Ganzizhou mine, Meigu County, Liangshan Prefecture, Sichuan Province, China; (*right*) 12 cm, (*below*) 11.4 cm, (*below right*) 9 cm.



新疆
XINJIANG UYGHUR A. R.

The highest peak in the Tianshan Mountains, Victory Peak at 7,439 meters. Photo © Krishna Wu.

Xinjiang Uyghur Autonomous Region, located in northwestern China, covers over 1,600,000 km^2, about one-sixth of China's total territory, making it China's largest province. But its population is only 1.4% of the country's total. Xinjiang, with its large reserves of various metallic ores, has a bright future for collectible minerals. A total of 138 different mineral species have been documented from Xinjiang, including abundant gold, chromium, copper, nickel and rare earth deposits. Xinjiang is also China's most important gemstone-producing region and is particularly well known for its aquamarines. The major localities for gem beryl are distributed through the Altai Mountains, though notable localities are also found in the Junggar basin and the Tianshan Mountains.

Wulfenite, 19 cm, from the Jianshan mine, Kuruktag Mountains, Ruoqiang County, Bayingolin Prefecture, Xinjiang Uyghur Autonomous Region, China. Found in 2008.

Wulfenite, 12.5 cm, from the Jianshan mine, Kuruktag Mountains, Ruoqiang County, Bayingolin Prefecture, Xinjiang Uyghur Autonomous Region, China. Found in 2009. This specimen is probably the finest known Chinese wulfenite.

Emerald on matrix, 4.5 cm, from Daftar, Tashiku'ergan County, Kashi Prefecture, Xinjiang Uyghur Autonomous Region, China.

云南
YUNNAN PROVINCE

The classic karst formations of Shihilin Stone Forest National Park. Photo © chrisdouglas123.

Yunnan Province is a very important mineral and gemstone producing area containing China's largest reserves of tin, lead, zinc and copper. There are plenty of mineral localities containing collectible specimens, but only a few of them are widely known. Of these, the mineral and gemstone specimens produced in the Ximeng, Wenshan, Malipo, Maguan, Tengchong, Weishan, Yuanyang, Honghe, Yuanjiang, Jingping, and Fugong areas are particularly admired by crystal collectors. For example, the cassiterite from the Ximeng mine is noted for its bright luster, large crystal size and beautiful transparency.

Topaz crystal, 21 cm (8 kg!), from the pegmatites along the Nu River, Gaoligong Mountains, Nujiang Prefecture, Yunnan Province, China.

Hemimorphite, 11 cm, from the Malipo mine, Wenshan County, Wenshan Prefecture, Yunnan Province, China.

Babingtonite with prehnite, 15 cm, from the Hongquizhen quarry, Meigu County, Liangshan Prefecture, Yunnan Province, China.

(*right*) Calcite cave formation, 27 cm, from Wenshan County, Wenshan Prefecture, Yunnan Province, China.

(*below right*) Calcite crystal, 16 cm, from Wenshan County, Wenshan Prefecture, Yunnan Province, China. Ex Gene Meieran collection.

(*below*) Calcite cave formation, 24.3 cm, from Wenshan County, Wenshan Prefecture, Yunnan Province, China.

(*above*) **Aquamarine with smoky quartz, 8.3 cm, from Da Li, Yunnan Province, China. Found in 2010.**

(*above left*) **Cassiterite crystal, 8.3 cm, from the Amo mine, Ximeng County, Pu'er Prefecture, Yunnan Province, China. Ex Steve Smale collection.**

(*left*) **Emerald in matrix, 9.3 cm, from the Dayakou mine, Malipo County, Wenshan Prefecture, Yunnan Province, China. Found in 2011.**

THE LAVINSKY CHINA COLLECTION

Chinese culture has always been intricately interwoven with an appreciation for nature on an artistic level, and Westerners might think that this would be an ideal orientation for the growth of mineral collecting. However, very few Chinese had access to the products of mines, or wanted to venture underground in such dangerous places. What developed, in contrast to the Western cultural tradition of housing mineral specimens with other natural history items in "Cabinets of Curiosities," was an appreciation of the sculptural quality of naturally shaped rocks and boulders which became known as "scholars' stones" or "view stones." These are examples of what Westerners would call "found art," stumbled upon in the streams and valleys of China by hikers and wandering scholars. View stones have always had an inspirational, aesthetic appeal for the Chinese. Since they did not come from mines and did not represent "mineral wealth" in any intrinsic sense, the Chinese collectors cared nothing for the actual mineralogical or petrological content of the specimens. Even today, Chinese museums largely reflect this preference.

In modern times, the Chinese populace, now including a very prosperous and growing middle class, has finally begun to turn its eye toward the sculptural and colorful aesthetics of actual crystallized mineral specimens—especially those found in China, where mining is now a major industry, and where miners have a new financial incentive to preserve specimens for private sale.

Fortunately, the awareness of the *value* of fine mineral specimens has been widespread in China since at least the mid-1980s, and consequently many miners have been involved in collecting mineral specimens to resell—primarily to Americans who have then distributed them to the rest of the mineral world. Many mining areas have developed a system for the removal and marketing of specimens through a series of intermediaries and wholesalers, and many miners have become quite skilled at extracting specimens undamaged. As a result, a number of fine collections of Chinese minerals have been built in Western countries.

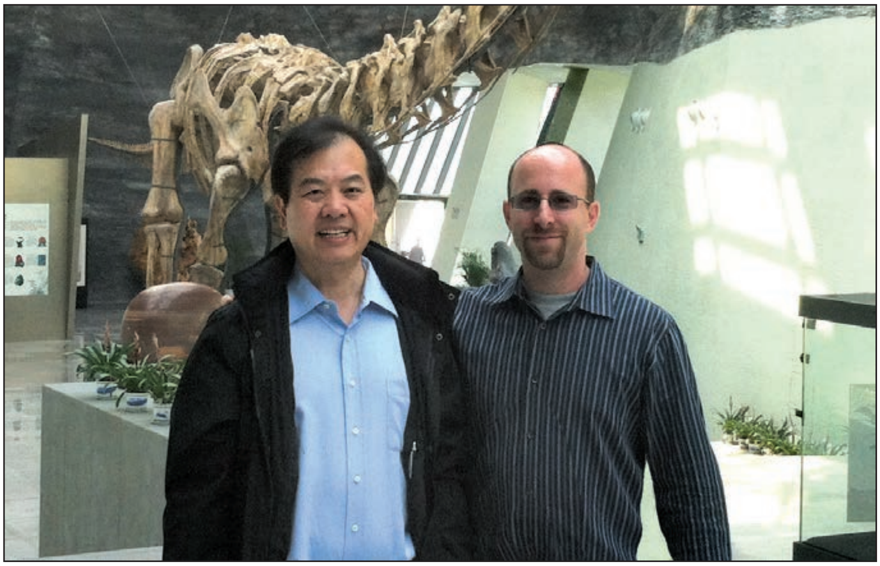
During this time of transition when Chinese minerals were coming out in a veritable flood, Robert Lavinsky recognized a tremendous opportunity, and for the last 15 years has positioned himself as a high-end buyer of cabinet-size specimens from China. Amidst many other collectors who specialized in Chinese minerals of smaller sizes, he became widely known as a collector of larger Chinese specimens of ultra-high quality. Thanks to this growing reputation, many fine, newly discovered specimens were brought to him from one source or another. Even many American dealers who were obtaining fine Chinese minerals would often give him first refusal, in large part because they respected what he was trying to do in building a locality-specialized collection that would be a tribute to China—comparable in concept to what Miguel Romero did for Mexican minerals in their heyday (see the supplement to the 2008 November-December issue of *The Mineralogical Record*), and what Lindsay Greenbank did for northern English minerals (see the supplement to the 2010 January-February issue of *The Mineralogical Record*).

The Lavinsky China collection will be on exhibit at the University of Arizona's Flandrau Science Center, premiering in February during the Tucson Gem and Mineral Show and running through the rest of the year. This special supplement to the *Mineralogical Record* illustrates many of the specimens shown in the Flandrau exhibition and can serve as a companion publication and exhibit catalog for the only major museum exhibition ever mounted to showcase Chinese minerals in the United States. Pictured here are some of the ikonic pieces from the era of China's first explosion onto the world mineral collecting scene, mainly from 1990 to 2010, as well as very recently found world-class specimens from Inner Mongolia.

The Chinese specimens pictured here, spectacular treasures in the longstanding Western style of natural history collecting, are examples of a precious patrimony that every Chinese citizen can be proud of, and will serve to inspire a new generation of collectors in China and worldwide.

Wendell E. Wilson

Dr. Wendell E. Wilson, a life-long mineral collector, is Publisher and Editor-in-Chief of the Mineralogical Record *magazine. He received his PhD in Mineralogy and Isotope Geochronology at the University of Minnesota, in 1976. After joining the Mineralogical Record he founded the Mineralogical Record Library, established the Antiquarian Reprint Series to preserve early literature, and was presented with the Carnegie Mineralogical Award in 2001. The mineral* wendwilsonite *was named in his honor in 1987.*



Dr. Guanghua Liu

Guanghua Liu was born in Xikuangshan, Hunan Province, where one of the world's greatest antimony mines is located. After graduating from high school in 1973, he was sent to the countryside (to work on a tea farm) like all youth during the Cultural Revolution in China. He graduated from the Geology Department of the Jiaozuo Mining College in 1978, and went on to earn his Master's Degree in Coal Geology and Sedimentology from the China University of Geosciences in 1981. That same year he joined the faculty of that institution, first as a lecturer and subsequently as associate professor. In 1987 he went to Tübingen University in Germany as a visiting scholar, and received his PhD degree in Geology there in 1992. He joined the scientific staff of Tübingen University, and also worked as a consultant to several international companies involved in the Chinese coal industry. His wide interests are illustrated by over 90 academic papers and books on geology, coal and coal bed methane technology, and on mineral deposits in English, French and Chinese journals.

Dr. Liu's residence is in Germany now, where he operates a consulting and trading company, AAA Minerals International. He returns to China often, serving as a guest professor at the Chinese University of Mining and Technology and the Chinese University of Geosciences in Beijing. After selling his coal and gas consulting business in 2010, he became a full-time independent consultant working on projects for natural history museums in China. In 2011 he completed the establishment of the "Guanghua International Mineral and Fossil Museum" at the Wuxi Science Museum and View Stone Park (where his extensive personal collection of minerals is on display), and he is currently working with the Shaanxi Nature Museum in Xi'an, Shaanxi Province, on exhibition galleries devoted to minerals and fossils.

Dr. Liu began collecting minerals in 1988, specializing in Chinese localities, and has been involved in the mineral business on a part-time basis since the mid-1990s. Currently he is spending much time working on the improvement of public education in mineralogy in China, and on developing connections between the Western countries and China for the exchange of mineral collecting ideas and information.

Dr. Robert Lavinsky

Dr. Robert Lavinsky, proprietor of The Arkenstone mineral dealership, was born in Columbus, Ohio, where he began collecting calcite at age 13. He enjoyed the support of many mentors in the Columbus Rock and Mineral Society, including Carlton Davis, field collectors John Medici and Henry Fisher, and dealers Neal and Chris Pfaff, among others. He eventually expanded his scope to collecting United Kingdom classics, Sweet Home mine rhodochrosite, worldwide classics, and (especially) the minerals of China. As a field-collector he dug for minerals in the dolostone quarries and roadcuts throughout Ohio, Indiana, Kentucky (Halls Gap millerite), Ontario (Bancroft), and various other localities.

Rob received his BA degree in Biochemistry and History from Rice University in Houston, Texas in 1995, and went on to earn his PhD in Molecular Genetics at the University of California San Diego in 2000. The first time he formally sold minerals as a dealer at a show was in 1986 (at the age of 14) at the Columbus Show. During the years from 1986 to 2000 he gradually bought and sold more specimens, becoming a part-time mineral dealer by degrees, and finally becoming a full-time dealer after graduation, in 2000.

Rob feels that his major contribution has been to help move the hobby of mineral collecting onto the internet—his business went online (www.irocks.com) in 1996, and was among the first to do so. He has also actively sought ways to spur education and interest in old classics and rarities through the venue of the internet, and sells selected reference works via his website. To help encourage young collectors as Rob's mentors did for him, he sponsors an award for the best exhibit by a junior-division competitor each year at the Tucson Gem and Mineral Show.

Although he has been in business full-time for just a few years, he has handled the sale of a remarkable number of important collections, including all or part of the collections of Dr. Edward David, Marshall Sussman, Gary Hansen, Dr. Eric Asselborn, Carlton Davis, Martin Zinn, Marilyn Dodge, Ed Ruggiero, Richard Hauck, Violet Dawson, Peter Bancroft, Miguel Romero, Lindsay Greenbank, and Herb Obodda, among many others.

The new mineral species *lavinskyite* was named in his honor in 2012.

THE UNIVERSITY OF ARIZONA MINERAL MUSEUM

The Mineral Museum of the University of Arizona is becoming well known in the mineral world for staging spectacular temporary exhibits of specimens on loan from museums and, especially, private collections. In the past, exhibits have focused on such topics as the collection of the late Hubert de Monmonnier, and the minerals of Pakistan and Afghanistan ("Dangerous Beauty"). Their exhibition devoted to the minerals of Bisbee, Arizona ("Treasures of the Queen"), was complemented by a supplement to the *Mineralogical Record* picturing many of the specimens that were on display, preserving a record of that months-long but still transient event. This year the topic is equally spectacular: the Crystalline Treasures of China. The specimens shown are primarily from the personal collection of Dr. Robert Lavinsky. Dr. Robert Downs, who originated the idea of temporary mineral exhibits such as these at the Flandrau, and Curator Mark Candee are to be complimented for their work in helping to prepare and mount this exhibit.

Although temporary exhibits are a big attraction for mineral collectors, the Museum's permanent collection is well worth a look as well. The University of Arizona Mineral Museum houses one of the finest mineral collections in any university. It began with an act of the Arizona State Legislature establishing a School of Mines in Tucson, Arizona Territory, in 1885; the main building opened for classes in 1891, and Arizona became a state 21 years later, in 1912. The original building, known today as "Old Main," still stands at the center of the sprawling University of Arizona campus.

Mineralogy was one of the subjects originally taught at the University, and a proper collection of minerals was essential for teaching purposes. The 1892 *University of Arizona Register* states: "In addition to collections made by Prof. Blandy, formerly Territorial Geologist, the private collections of the Director of the School of Mines (Dr. Theo. Comstock) are on deposit in the Museum." This is the first reference to the Mineral Museum, and suggests that it was established prior to 1892.

In 1893 the Territorial Museum was established on campus, incorporating not just the growing mineral collection but also ethnographic artifacts and historical documents. The mineral collection was the responsibility of William Phipps Blake, who arrived in 1895 as the new Director of the School of Mines, as geology and mining instructor, and as the first Territorial Geologist. He took an active interest in the Territorial Museum, and increased the size and scope of the mineral collection. By 1900 many fine specimens of Arizona minerals were on display; "Among these may be mentioned particularly superb specimens from the mines of the Copper Queen at Bisbee."

The Territorial Museum was moved to new quarters in 1905, in 1915, and again in 1919 when the new Mines and Engineering Building was completed, and the Mineral Museum once again became a formal entity of its own. Prominent faculty members including Frank Nelson Guild (1870–1939), Frederick Leslie Ransome (1868–1935), Bert Sylvenus Butler (1877–1960), Maxwell Naylor Short (1889–1952) Frederic William Galbraith (1903–1985), John Williams Anthony (1920–1992) and Terry C. Wallace were especially involved in the growth and curation of the collection. In 1957 the collection was finally given spacious, well-lit quarters and refurbished cases in the newly completed Geology Building, where it resided for many years until being transferred a few years ago to equally spacious quarters on the lower level of the Flandrau Science Center. Students, alumni, the State of Arizona, the Tucson Gem and Mineral Society, and local mining companies (including especially Phelps-Dodge Corporation) have all assisted the continued growth of the collection. Other donors have included P. G. Beckett, Boodle Lane, Martin Schwerin, Russell Honea, J. E. Burtin, Susie Davis, Richard Bideaux, Hubert de Monmonnier and Wendell Wilson.

Today the mineral museum houses over 19,000 specimens in the main collection and over 6,000 in the micromount collection (built primarily by Arthur Roe). Over 3,000 different species are represented, and over 2,000 specimens are currently on display. The mineral museum also has two displays of meteorites from localities around the world. Minerals from famous Arizona localities such as Bisbee and Tiger also have special displays. The mineral collection of the RRUFF project (an integrated database of Raman spectra, X-ray diffraction and chemistry data for minerals) belongs to the mineral museum, and a research curator position is being established to bring a research component to the museum.

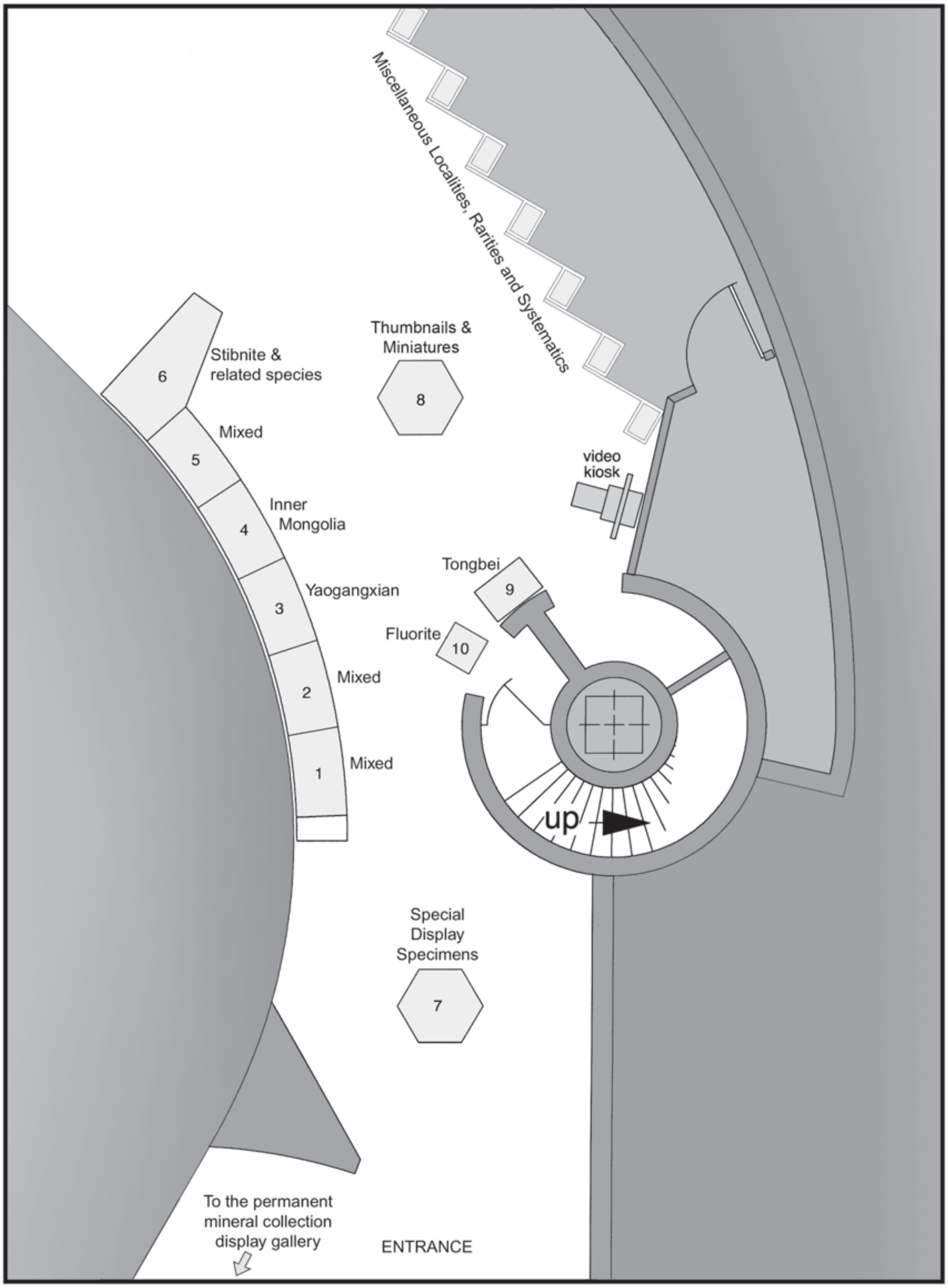
As an attractive and interesting complement to the minerals, a collection of 17 historic oil paintings of mining scenes from the 1920s at Bisbee, Arizona and Nacozari, Sonora, by William Davidson White (1896–1971), lines the walls.

The museum is open during regular hours and is always a favorite stop for mineral collectors who are in Tucson for the annual Tucson Gem and Mineral Show in February. Special exhibits and lectures are often coordinated with the show. For more information see www.Flandrau.org/.

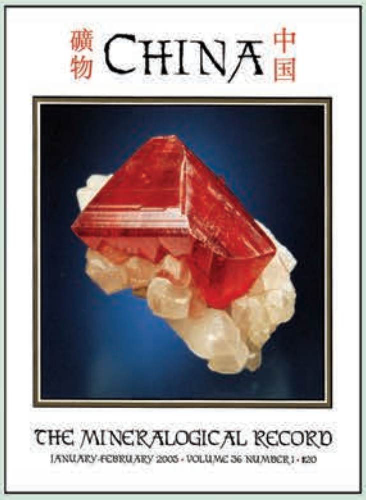
Wendell E. Wilson

CRYSTALLINE TREASURES OF CHINA

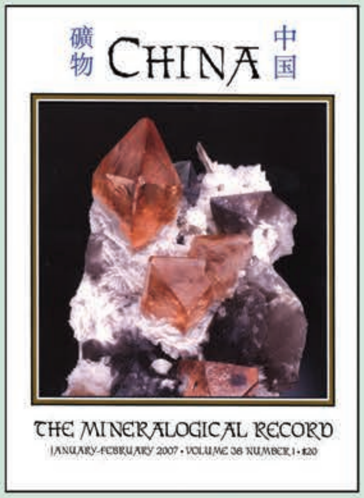
An exhibit of Chinese Minerals at the Flandrau Science Center



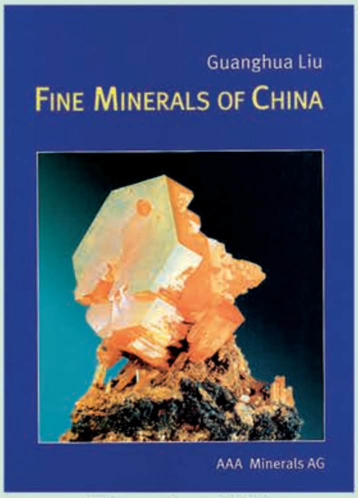
Take the advice of the Master
and learn all you can ...



Mineralogical Record
China Issue #1: vol. 36, no.1



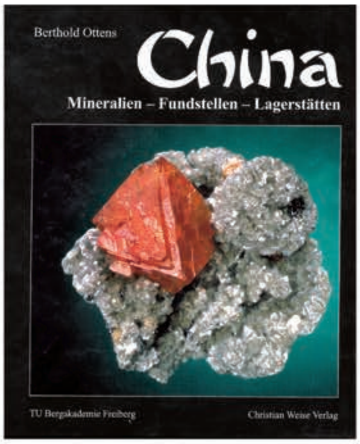
Mineralogical Record
China Issue #2: vol. 38, no. 1



Guanghua Liu's
Fine Minerals in China

Mineralogical Record
China Issue #3: vol. 42, no. 6

Mineralogical Record
China Issue #4: vol. 43, no. 5



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www.MineralogicalRecord.com

Mindat.org 是国际互联网上最大的矿物数据库和矿物学参考网站，其中文版即将面世。
来年我们会先设有中文版首页，再逐渐添加中文内页面。
有关 Mindat.org 中文版发布事项，请于 2013 年保持关注 Mindat.org 首页。

The mindat.org online mineral database will soon be launching a Chinese home-page, as the first step towards a full Chinese-language mindat.org website. Check the home page of mindat.org for the latest news about this exciting development!

Mindat.org中文版本

mindat.org - 矿物和地区产地数据库
41641 的矿物名称（包括同义词，品种等）. 235287 不同的地区产地. 481680 会员上载矿物照片.

12月 3日

搜索页

支持 Mindat.org

其他页面

欢迎来到 Mindat.org

Mindat.org是国际互联网络上最大的矿物数据库和矿物学参考网站。这个网站包含世界各地的矿物数据，矿物收集数据，矿产地的数据和其他矿物的信息。

这个网站每天无论在新的矿物信息，矿产地地方. 照片和添加成员等 都不停增长。

Mindat目录是矿产经销商，宝石，宝石，化石，学社，矿物展览会及活动 和个人网站的在线资源。请浏览我们拥有2510以上矿产经销商公司和网站的完整列表，或可添加您的企业网站。

Mindat 搜索

搜索此数据库的矿物，宝石，岩石，矿物的位置和照片：

搜索 - 任何 -
矿物名称
地区产地名称
关键字

Mindat 新闻消息

20th November 2012
Mindat.org Conference 2012 - Morocco

29th October 2012
The Munich Mineral Show 2012

18th October 2012
Minerals Newspaper - Issue 5

26th July 2012
An exceptional fluorite specimen

17th July 2012
Ste Marie Aux Mines 2012

12th June 2012
Minerals Newspaper - Issue 4

9th February 2012
Tucson 2012 - Report

20th December 2011
Defending the freedom to collect minerals.

19th November 2011
SMLS - Haywards Heath Mineral Show 2011

3rd November 2011
The Munich Mineral Show 2011

最新的讨论

Re: Gail's NEW favourite of the day, PART 2
18:39 3rd Dec 2012 - posted by Ibrahim Jameel

Re: Russell garnets
17:44 3rd Dec 2012 - posted by Susan Robinson

Re: Colorless enstatite from Sri Lanka?
17:44 3rd Dec 2012 - posted by Tim Jokela Jr

Re: New Show Location
17:43 3rd Dec 2012 - posted by Wayne Corwin

Re: Gold in Beardmore, Ontario
17:37 3rd Dec 2012 - posted by Tim Jokela Jr

矿物经销商新闻

3rd Dec - e-Rocks
Another Auction Packed Monday!

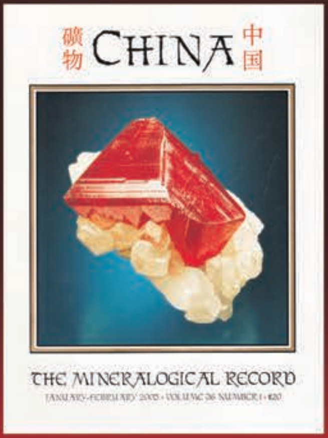
2nd Dec - Mineralspauli
Updates

2nd Dec - e-Rocks
Sunday Tea Time

1st Dec - e-Rocks
Saturday's Round Up!

30th Nov - e-Rocks

http://cn.mindat.org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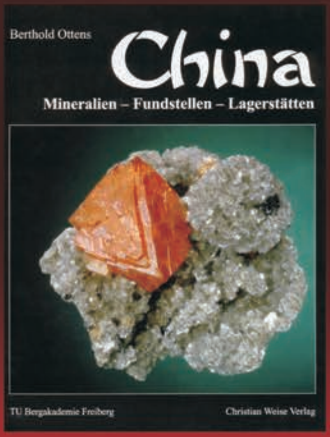
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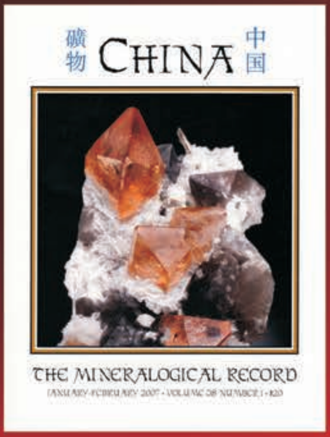
Mineralien – Fundstellen – Lagerstätten
TU Bergakademie Freiberg
Christian Weise Verlag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